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EVALUATION OF DoD INFORMATION
ANALYSIS CENTERS PROGRAM:
REPRESENTATIVE SAMPLE STUDY -
BENEFITS TO DoD FROM USE OF
DoD INFORMATION ANALYSIS CENTERS

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June 1990

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ABSTRACT

The following IDA paper summarizes the results of an assessment of benefits to DoD resulting from the use of three DoD Information Analysis Centers (IACs) by DoD components and DoD contractors. The IACs examined in this report include the Chemical Warfare/Biological Defense Information Analysis Center (CBIAC), the Tactical Weapon Guidance and Control Information Analysis Center (GACIAC), and the Reliability Analysis Center (RAC).

Information Analysis Centers provide information to users under two different categories of services. One category is a core program, supported by Defense Logistic Agency funds. The second category is special tasks, supported by tasking and funding from requiring DoD agencies.

The study found that it was possible to quantify some of the benefits reported by IAC users. However, most users interviewed by the IDA team did not conceive of their information requests in terms that lent themselves to quantification. They did not, for example, consider the costs of obtaining similar information from alternative sources, nor did they consider the costs of obtaining information had they undertaken the information search and analyses themselves. As a result, IAC users who turned to the IAC for core products and services found it especially difficult to quantify benefits.

In several instances, IDA was able to analyze the benefits reported and identify a conservative basis for estimating the dollar benefits of IAC information products and technical advisory services. In some cases, these estimates were based on tangible or estimated savings compared to the costs of using alternative sources of information. In other instances, these quantified benefits were estimated based on changes to organizational routines and behaviors. In still other instances, we were able to obtain firm estimates from users regarding improvements in their organizations' productivity, labor utilization, or costs associated with trying to obtain similar information relying on internal resources.

However, it was possible to categorize qualitative benefits provided by IACs as follows: verification and/or substantiation of existing information; verification or substantiation of information from a neutral, unbiased authoritative source; enhanced

productivity; promotion and/or implementation of standards and standardization; enhanced communication among scientists and engineers; enhanced competitiveness within the defense industrial base; and improved military capability.

IAC users who employed CBIAC, GACIAC, and RAC to perform additional tasks had somewhat better success in either directly quantifying benefits, or collecting data which permitted IDA staff to quantify a lower bound for the benefit resulting from the IACs task. Special tasks result in specific information products or the provision of specific technical advisory services. These lend themselves to comparisons and contrasts with other methods of obtaining similar information or advice, the costs for which can be estimated. Special task users also reported very substantial qualitative benefits, particularly in improvements in military capability, military training, R&D planning, and R&D productivity.



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TABLE OF CONTENTS

Abstract	iii
Glossary	ix
Executive Summary	S-1
1. REPORT BACKGROUND AND INTRODUCTION	1
A. History	1
B. IDA Tasking	4
1. Scope of Work	4
2. Pilot Study	5
3. Representative Sample	7
C. Summary	9
2. INFORMATION ANALYSIS CENTERS	11
A. IAC Functions	11
B. Core Products and Services	15
C. Special Tasks	16
D. IAC Program Developments, FY 1987-FY 1989	17
1. Funding Profile	17
2. New Starts	22
3. Desired New Starts/Restarts	23
E. The Representative Sample of DoD IACs	23
3. REPRESENTATIVE IAC SAMPLE STUDY METHODOLOGY	25
A. Operational Audit Approach	25
B. Development of Interview Instruments	26
C. Representative Sample Selection Criteria	29
D. Administration of Survey Instruments	31
E. Representative Sample Study Emphasis	33
F. Summary	33
4. BENEFITS FROM CBIAC	35
A. Introduction	35
B. Core Program Description	36

C.	Benefits from the Core Program	38
1.	Benefits of General Distribution Products	38
2.	Benefits of Individual Response Services.....	38
D.	Benefits from Special Tasks.....	47
1.	Background.....	47
2.	Benefits Discussion: Overview	50
3.	Quantitative Benefits Assessment	52
4.	Qualitative Benefits Assessment.....	54
E.	Other Users and Other Benefits	62
1.	Users in DoD Programs.....	62
2.	Other Users Beyond the Identified Specific IAC Communities	63
F.	Summary	63
5.	BENEFITS FROM GACIAC	67
A.	Introduction	67
B.	Core Program Description	68
C.	Benefits from the Core Program	70
1.	Types of Core Products and Services	70
2.	Benefits of General Distribution Products	71
3.	Benefits of Individual Response Services.....	72
D.	Benefits from Special Tasks.....	78
1.	Background.....	78
2.	Summary Results	80
3.	Quantitative Benefits Assessment	82
4.	Qualitative Benefits Assessment.....	85
E.	Other Users and Other Benefits	90
1.	Users in DoD Programs.....	90
2.	Other Users Beyond the Identified Specific IAC Communities	91
F.	Summary	91
6.	BENEFITS FROM RAC.....	93
A.	Introduction	93
B.	Core Program Description	94
C.	Benefits from Core Program	96
1.	Types of Core Products and Services	96
2.	Benefits of General Distribution Products	97
3.	Benefits of Individual Response Services.....	98
D.	Benefits from Special Tasks.....	103
1.	Background.....	103
2.	Summary Results	105
3.	Quantitative Benefits Assessment	106
4.	Qualitative Benefits Assessment.....	108
E.	Other Users and Other Benefits	112
1.	Users in DoD Programs.....	112
2.	Other Users Beyond the Identified Specific IAC Communities	112

F. Summary	112
7. SUMMARY AND CONCLUSIONS.....	115
A. Introduction	115
B. Benefits of Core IAC Information Products and Services	115
1. Core Product and Service Selection.....	116
2. Core Product and Service Quantitative Benefits	117
3. Core Program Qualitative Benefits	117
C. Special Task Benefits	118
1. Special Task Selection and Review	118
2. Special Task Quantitative Benefits	119
3. Special Task Qualitative Benefits.....	121
D. Summary and Conclusions	123

APPENDICES

Appendix A-- DoD Regulation 3200.12-R-2, "Centers for the Analysis of Scientific and Technical Information"	A-1
Appendix B-- DoD Information Analysis Centers	B-1
Appendix C-- Questionnaire Used in IAC Evaluation Study	C-1
Appendix D-- Individual Response Benefits from CBIAC	D-1
Appendix E-- Individual Response Benefits from GACIAC.....	E-1
Appendix F-- Individual Response Benefits from RAC.....	F-1

GLOSSARY

CBIAC	Chemical Warfare/Biological Defense Information Analysis Center
CHEM DEMIL	Chemical Demilitarization
COTR	Contracting Officer's Technical Representative
CPIA	Chemical Propulsion Information Agency
CRDEC	Chemical Research Development and Engineering Center
CRSTIAC	Cold Regions Science and Technology Information Analysis Center
CSERIAC	Crew Systems Ergonomics Information Analysis Center
CTM	Contract Technical Monitor
CW	Chemical Warfare
DACS	Data Analysis Center for Software
DASIAC	DoD Nuclear Information Analysis Center
DDDR&E	Deputy Director for Defense Research and Engineering
DLA	Defense Logistics Agency
DOD	Department of Defense
DOE	Department of Energy
DROLS	Defense Research On-Line System
DTIC	Defense Technical Information Center
ECP	Engineering Change Plan
EIS	Environmental Impact Statement
GACIAC	Tactical Weapons Guidance and Control Information Analysis Center
HEIAC	Hydraulic Engineering Information Analysis Center
HTMIAC	High Temperature Materials Information Analysis Center

IAC	Information Analysis Center
IDA	Institute for Defense Analyses
IRIA	Infrared Information Agency
MCIC	Metals and Ceramics Information Center
MMCIAC	Metal Matrix Composites Information Analysis Center
MTIAC	Manufacturing Technology Information Analysis Center
NTIAC	Nondestructive Testing Information Analysis Center
OSD	Office of the Secretary of Defense
PCO	Procuring Contracting Officer
PLASTEC	Plastics Evaluation Center
PSTIAC	Pavements and Soil Trafficability Information Analysis Center
R&AT	Office of the Deputy Director for Defense Research and Engineering, Research and Advanced Technology
RAC	Reliability Analysis Center
RDT&E	Research, Development, Test, and Engineering
SMIAC	Soil Mechanics Information Analysis Center
STIP	Scientific and Technical Information Program
SURVIAC	Survivability/Vulnerability Information Analysis Center
TEPIAC	Thermophysical and Electronic Properties Information Analysis Center (now the High Temperature Materials Information Analysis Center)
USG	United States Government

EXECUTIVE SUMMARY

INTRODUCTION

The Department of Defense operates 22 Centers for the Analysis of Scientific and Technical Information (Information Analysis Centers--IACs).¹ These IACs serve as focal points within the DoD for acquiring, storing, and synthesizing available worldwide scientific and technical information and/or data in a clearly defined, specialized field or subject area of interest to DoD. Once acquired, this information is then digested, analyzed, evaluated, synthesized, and may be published in authoritative, timely, standard reference works and useful reports or conveyed in technical advisory services to the requiring DoD activities.

The following report summarizes the results of IDA's review of the benefits to DoD resulting from the use of three DoD Information Analysis Centers (IACs) by DoD components and DoD contractors. Information products and services provided by the Chemical Warfare/Biological Defense Information Analysis Center (CBIAC), the Tactical Weapon Guidance and Control Information Analysis Center (GACIAC), and the Reliability Analysis Center (RAC) were examined to identify and quantify, where possible, benefits to DoD and its contractors.

This phase of the IDA study also examined the administration, management, and oversight of the DoD IAC program. The results of this program assessment are summarized in a separate report.

STUDY METHOD

The basic approach taken by IDA in both the pilot study and the representative IAC sample study was as follows:

- Identify program goals and objectives as articulated by DoD directives, policy statements by authoritative DoD spokesmen, and senior program managers.

¹ See Appendix A for DoD Regulation 3200.12-R-2, "Centers for the Analysis of Scientific and Technical Information." See Appendix B for a listing of current DoD Information Analysis Centers.

- Identify or develop appropriate quantitative and qualitative measures of merit to be used in assessing the cost, benefit, effectiveness, and performance of individuals and organizations participating in the management, oversight, operation, and evaluation of the DoD Information Analysis Center Program,
- Develop questionnaires and other instruments needed to collect data bearing on the measures of merit appropriate to each organization participating in the management, oversight, operation, or evaluation of DoD Information Analysis Centers,
- Conduct interviews and review records, where appropriate, in order to collect data, and
- Analyze data collected during the field survey phase of the study.

A general questionnaire was prepared and was significantly tailored or modified to elicit information regarding the specific responsibilities of each individual for IAC programming, budgeting, operations, management, oversight, and performance evaluation. Each questionnaire was reviewed with the sponsor and further modified in order to elicit additional information that might be helpful in obtaining both direct and indirect evidence of costs and/or benefits of the IAC program to DoD.

During this phase of our study, we sought to examine the benefits to DoD from the use of IACs as different from the Nondestructive Testing Information Analysis Center considered in detail in our pilot study. Among the more specific criteria used to screen the remaining IACs were the following:

- Focus of IAC not in the field of materials science
- IAC users from the research and engineering community, especially those funded from budget category 6.1 through 6.3A funds
- IAC work being performed substantially in subject areas subject to export controls and/or national security classification
- IAC in the initial contract period with the Defense Logistics Agency
- IAC with a Contracting Officer's Technical Monitor not on the OSD staff
- IAC whose Procuring Contracting Officer was not a DLA staff member.

We selected the Chemical Warfare/Biological Defense Information Analysis Center (CBIAC), the Tactical Weapons Guidance and Control Information Analysis Center (GACIAC), and the Reliability Analysis Center (RAC) to be included in our examination of benefits to users of a representative sample of DoD IACs.

IAC INFORMATION CATEGORIES

DoD IACs provide information products and services to their respective user communities in two major categories: core program information products and services, and special task products and technical advisory services. During this phase of our study, we examined samples of core program information focusing most heavily on individualized responses to bibliographic inquiries, technical inquiries, and referrals to additional sources of information prepared for identified persons during FY 1988. We sought to identify both quantitative and qualitative benefits accruing to DoD as a result of the use of the core products and services.

We also examined the results of special studies and tasks provided by CBIAC, GACIAC, and RAC. While our list of special tasks dated back to 1985 in the cases of GACIAC and RAC and 1986 in the case of CBIAC, most of the information collected from IAC users dealt with benefits identified from special tasks undertaken and completed in 1987 and 1988.

BENEFITS OF DOD IAC CORE PROGRAMS

Quantitative Benefits

Although we interviewed more than 150 users of core information products prepared by CBIAC, GACIAC, and RAC, we found relatively few instances in which benefits could be quantified. Eight CBIAC core program information consumers reported that during calendar year 1988 that they had saved in excess of \$565,000. This judgment was based on the estimated costs of obtaining information equivalent to that provided by CBIAC by other means (materials testing) or from other sources. One GACIAC user reported a benefit of using GACIAC to prepare a bibliography in terms of man-days saved. This user did not translate the savings in labor hours to savings in dollars. One RAC core user reported saving approximately \$850 by relying on RAC to provide documents which could otherwise be obtained but at higher cost and considerable delay.

The IDA study team was able to quantify some of the benefits reported by examining estimated costs of obtaining similar information from alternative sources. We were also able to estimate benefits by examining estimates of costs that might have been incurred had IAC information products and services not been available to the requiring DoD activity. In no case, however, did IDA rely exclusively on estimates of cost savings provided by IAC user.

Qualitative Benefits

We did find that most core program users could describe in fairly rigorous terms a broad range of qualitative benefits they obtained by turning to DoD IACs. These qualitative benefits can be grouped into the following categories:

- Verification of information;
- Absolute objectivity;
- Enhanced productivity;
- The ability to work to standards (in some cases, the standards the IAC helped to produce);
- Greater competition;
- Enhanced communication; and
- Improved military capability.

Table S-1 summarizes the number of times an IAC user identified a qualitative benefit obtained from CBIAC, GACIAC, or RAC. The reader is reminded that several users reported multiple qualitative benefits from their individual response information item.

Table S-1. Qualitative Benefits of Representative Sample DoD IAC Individual Response Information Items

Benefit Category	CBIAC	GACIAC	RAC
No Defined Qualitative Benefit	11	36	8
Verification/Substantiation	22	3	14
Objectivity & Neutral Competence	9	1	3
Enhanced Productivity	44	11	9
Standards and Standardization	6	0	0
Enhanced Communication	4	11	0
Enhanced Competitiveness	8	2	3
Enhanced Military Capability	7	3	2
Total # of Tasks Examined	75	50	33

At the macro level of analysis, the core users with whom we spoke were generally able to identify a qualitative benefit from relying on one of the DoD IACs included in our representative sample. On further analysis, it appears that the core program at each IAC is in fact accomplishing one of the primary purposes of IAC program as a whole--promoting the exchange and dissemination of scientific and technical information in fields of science and technology in which DoD maintains a significant programmatic thrust.

BENEFITS OF DOD IAC SPECIAL TASKS

Our study also sought to identify both quantitative and qualitative benefits to DoD accruing from the use of CBIAC, GACIAC, and RAC. We examined a listing of special tasks placed at each IAC for the most recent contract fiscal years. We then selected candidate special task users to be interviewed for our study to assess the benefits of DoD IACs. We commenced to interview identified users in as many locations as could be visited within the time and resource constraints of the task. The results of our interviews and assessment of the information obtained through them follow.

Quantitative Benefits

The study attempted to identify both quantitative and qualitative benefits to DoD resulting from the use of DoD IACs. The choice of DoD IACs as a source of information, analysis, and technical assistance made by special task users suggests an implicit judgment by special task customers that IACs offer at least benefits equal if not greater than the cost of special tasks. Table S-2 illustrates that in several instances, special task users of CBIAC, GACIAC and RAC were able to either document or provide information enabling the IDA study team to calculate quantitative benefits for several special tasks.

Table S-2. Quantitative Benefits From Selected DOD IACS

IAC	# of Tasks with Benefit Data	Total Cost of Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Tasks with Quantified Benefits		
CBIAC	32	\$4,268,000	\$1,407,500	<ul style="list-style-type: none"> • LOWER LABOR RATES • DEFERRED PROCUREMENT
	5	\$431,000		
GACIAC	14	\$5,286,000	\$5,045,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • REDUCTION IN FIELD TEST TIME • ACCELERATION OF R&D
	5	\$1,642,000		
RAC	8	\$1,916,000	>\$15,330,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • COST AVOIDANCE BY AVOIDING OF AMMO PLANT • IMPROVED RELIABILITY OF MILSTAR SYSTEMS
	3	\$1,225,500		

We found that many special task users of CBIAC, GACIAC, or RAC had great difficulty in quantifying the benefits resulting from their use of the IACs. When users were able to present their quantification of benefits or sufficient data to allow us to quantify the benefits, we saw considerable benefits. In the case of CBIAC, most of the quantifiable benefits were the result of lower labor rates or cost avoidance as a result of a specific special task. In the case of GACIAC, the IAC had developed several analytical tools and techniques which will result in recurring savings to the user community. The development of a terrain model of the Pacific Missile Test Center and its subsequent use in test mission planning, range instrumentation modernization, and test operations will result in recurring savings estimated by the Navy at several million \$ per year.

In the case of RAC, three tasks resulted in benefits which would be measured quantitatively. RAC's contribution to the Army's ammunition plant modernization program was very dramatic. The Army officials with whom we spoke credited RAC with development and implementation of the process control technology at new Army ammunition plants which obviated the need for \$2.1 billion in new construction. While the Army credited RAC with savings in excess of \$200 million, IDA partitioned the savings among all contractors and Army organizations participating in the ammunition plant modernization program. RAC's share of the \$200 million plus benefit was calculated by IDA at approximately \$9 million. Similarly, the program manager for the MILSTAR program credited RAC with saving the program \$6 to \$10 million per year over the life of the program once the satellites are in production. IDA elected to credit RAC with a one-time savings of \$6 million.

While it is not possible to develop a general benefit-cost ratio for all IAC special tasks, we found that where it was possible to calculate both direct contract or task costs for special tasks on the one hand and quantify benefits on the other, the benefit-cost ratio for the three IACs examined in this portion of our study was as follows:

CBIAC	3.3 to 1
GACIAC	3.1 to 1
RAC	12.5 to 1.

Qualitative Benefits

Although many special task users could not quantify the benefits of using CBIAC, GACIAC, or RAC, most could identify discrete qualitative benefits which in their minds

equaled or exceeded the costs of their special tasks. Table S-3 summarizes the qualitative benefits reported to the IDA study team.

Table S-3. Qualitative Benefits of Selected IAC Special Tasks

IAC	QUALITATIVE BENEFIT	EXAMPLE
CBIAC	IMPROVED CAPABILITY	<ul style="list-style-type: none"> • AIR BASE DEFENSE • AIR BASE OPERABILITY • ARMY CW DETECTORS • TANK CREW PROTECTION • NAVY CW TRAINING • AIR FORCE MASK TRAINING • NAVY CW/BW 6.2 PROGRAM • ARMY CHEMICAL DEMIL PROGRAM • CHEMICAL WARFARE STUDIES • BIOLOGICAL DETECTION • SMOKE AND OBSCURANTS PROGRAM • AIR FORCE MASK PROGRAM • EDGEWOOD A&E REVIEWS • BIOLOGICAL DEFENSE PROGRAM ENVIRONMENTAL IMPACT STATEMENT PROCESS
	IMPROVED TRAINING	
	IMPROVED R&D PLANNING	
	IMPROVED TESTING	
	NEUTRAL COMPETENCE	
GACIAC	IMPROVED CAPABILITY	<ul style="list-style-type: none"> • AEGIS ECCM/ESM PROGRAM • STINGER MODEL • E-O MODELING/COUNTERMEASURES • AEGIS TESTING/ASM TESTING • ARMY ANTI-AIR TESTING • ADVANCED AF MATERIALS TESTING • SAM/AAW SYSTEMS TESTING • NEW SENSOR MATERIALS FOR AF MATERIALS LABORATORY • IMPROVED ANTI-ARMOR TEST PROGRAM
	IMPROVED TESTING	
	IMPROVED R&D PLANNING MATERIALS FOR SENSORS ACCELERATED R&D	
RAC	IMPROVED CAPABILITY	<ul style="list-style-type: none"> • NAVAL AVIONICS • AIR FORCE EW POD • RELIABILITY CENTERED MAINTENANCE FOR MARINE CORPS VEHICLES • FAA TERMINAL AREA SURVEILLANCE
	LONG TERM SUSTAINABILITY	

Each IAC included in this phase of our study had at least one special task user who could identify a change in the operation of existing military forces which improved U.S. combat capability. We were surprised to see R&D-funded efforts contributing directly to improved operational capability with no additional investment of procurement or O&M funds. CBIAC and GACIAC were also credited by several special task users as playing

significant roles in the improvement of military training. CBIAC and GACIAC were credited with improving R&D, especially as a result of the sponsorship of classified meetings. These meetings provide a forum in which data can be collected, analyzed, shared, and ultimately reduced to proceedings which then become the basis for further study and analysis. CBIAC and GACIAC users felt that such meetings were essential to the enhanced flow of scientific and technical information and the acceleration of R&D throughout the communities served by these IACs.

SUMMARY AND CONCLUSIONS

We therefore conclude this phase of the IDA study, Evaluation of the DoD Information Analysis Centers Program, with the finding that core and special task users of CBIAC, GACIAC, and RAC are obtaining a wide range of benefits from the use of the IAC. In each IAC's case, the number of users able to describe quantitative benefits derived from core use is relatively small considering the total number of tasks examined; however, the quantitative benefits from special task use of the IACs are quite substantial. This appears to result from problems inherent in attaching value to information by information consumers. Most do not think in terms of information acquisition costs and the costs of obtaining similar information through alternative mechanisms.

We found that the qualitative benefits from both core and special task use of CBIAC, GACIAC, and RAC are quite significant. Each IAC has contributed to improved operational capability of existing military forces; each has contributed to improvements in the training of U.S. military personnel; all have been credited with improvements in R&D productivity.

Having concluded that DoD is benefiting from the Information Analysis Centers Program in its configuration circa 1987-1989, our study turned to an examination of program administration, management, and oversight. These topics are addressed in another IDA Paper available to U.S. Government personnel and authorized contractors, entitled *Evaluation of DoD Information Analysis Centers Program: Representative Sample Study; IAC Program Administration, Management, and Oversight*.

1. REPORT BACKGROUND AND INTRODUCTION

A. HISTORY

The Department of Defense operates 22 Centers for the Analysis of Scientific and Technical Information (Information Analysis Centers--IACs).² These IACs serve as focal points within the DoD for acquiring, storing, and synthesizing available worldwide scientific and technical information and/or data in a clearly defined, specialized field or subject area of interest to DoD. Once acquired, this information is then digested, analyzed, evaluated, synthesized, and may be published in authoritative, timely, standard reference works and useful reports or conveyed in advisory services to the interested DoD elements and DoD contractors in that specialized field.

The origin of the DoD program has been traced to the immediate post-World War II period with the initial support of information analysis centers located at the Johns Hopkins University Applied Physics Laboratory and the Naval Research Laboratory.³ The program grew substantially in the 1960s and 1970s in terms of the number of centers, and the number of disciplines included in the Information Analysis Center Program as well as the level of financial support given to these centers by the military departments. The program experienced considerable growth during the 1980s as DoD recognized increasing requirements to take advantage of the growing accumulation of scientific and technical information in fields of science and technology of special interest. Table 1-1 summarizes the development of DoD IACs.

² See Appendix A for DoD Regulation 3200.12-R-2, "Centers for the Analysis of Scientific and Technical Information." See Appendix B for a listing of current DoD Information Analysis Centers.

³ See Defense Technical Information Center, *Information Analysis Centers in the Department of Defense* (Alexandria, VA: Defense Logistics Agency, DTIC/TR-87/17, 1987), pp. 13-17, for a brief history of the DoD Information Analysis Center program. Cited as DTIC/TR-87/17 below.

Table 1-1. Growth of DoD IAC Program

IAC (Current Name)	Initial Year	Area of Focus & Technical Monitor Agency	Current Operator
Chemical Propulsion Information Agency (CPIA)	1946	Chemical Propulsion, Especially Rocket Propulsion (NAVSEA)	DLA Contractor
Infrared Information Agency (IRIA)	1951	Infrared Sensors, Materials and Sensors (NRL)	DLA Contractor
Metals and Ceramics Information Agency (MCIC)	1955	Titanium and Other Aerospace Materials and Structures (DDDR&E/R&AT)	DLA Contractor
Cold Regions Science and Technology Information Analysis Center (CRSTIAC)	1961	Effects of Cold Temperatures on Military Technology and Operations (Army Corps of Engineers)	Army Corps of Engineers In-House
DoD Nuclear Information Analysis Center (DASIAC)	1961	Nuclear Weapon Effects (DNA)	DNA Contractor
High Temperature Materials Information Analysis Center (HTMIAC)	1960	Thermophysical Properties of Materials with Special Focus on Laser Effects (ONT)	DLA Contractor
Plastics Technical Evaluation Center (PLASTEC)	1960	Plastics, Adhesives, and Organic-Matrix Composites (Army Corps of Engineers)	Army Corps of Engineers In-House
Nondestructive Testing Information Analysis Center (NTIAC)	1961	Nondestructive Evaluation and Testing of Materials, Structures, and Systems (DDDR&E/R&AT)	DLA Contractor
Concrete Technology Information Analysis Center (CTIAC)	1965	Concrete and Other Construction Materials (Army Corps of Engineers)	Army Corps of Engineers In-House
Hydraulic Engineering Information Analysis Center (HEIAC)	1966	Hydraulic Engineering (Army Corps of Engineers)	Army Corps of Engineers In House
Pavements and Soil Trafficability Information Analysis Center (PSTIAC)	1966	Favements, Vehicle Mobility and Terrain Analysis (Army Corps of Engineers)	Army Corps of Engineers In-House
Soil Mechanics Information and Analysis Center (SMIAC)	1966	Soil Mechanics, Geophysics and Engineering Geology (Army Corps of Engineers)	Army Corps of Engineers In-House
Coastal Engineering Information Analysis Center (CEIAC)	1968	Coastal Works Engineering Structures & Technology (Army Corps of Engineers)	Army Corps of Engineers In-House
Tactical Technology Center* (TACTEC)	1971	Tactical Warfare and Counterinsurgency (DARPA)	DARPA Contractor

(continued)

* This IAC is not part of the official DoD IAC program administered by the Defense Logistics Agency but is counted in the total of 22 DoD Information Analysis Centers.

Table 1-1 (continued)

IAC (Current Name)	Initial Year	Area of Focus & Technical Monitor Agency	Current Operator
Reliability Analysis Center (RAC)	1972	Electronic Materials and Component Reliability (AFRADC)	Air Force Contractor
Data & Analysis Center for Software (DACS)	1976	Software Development and Experience Data (AFRADC)	Air Force Contractor
Tactical Weapon Guidance and Control Information Analysis Center (GACIAC)	1977	Tactical Weapons Guidance Systems, Control Systems Sensors (USAMICOM)	DLA Contractor
Metal Matrix Composites Infor- mation Analysis Center (MMCIAC)	1979	Metal Matrix Composite Materials for Vehicles and Aerospace Applications (DDDR&E/R&AT)	DLA Contractor
Manufacturing Technology Information Analysis Center (MTIAC)	1984	Manufacturing Systems and Technology (DASD/PR)	DLA Contractor
Survivability/Vulnerability Information Analysis Center (SURVIAC)	1984	Aircraft and Other Vehicle Survivability, Vulnerability and Susceptibility (AFWRDC)	DLA Contractor
Chemical Warfare/Biological Defense Information Analysis Center (CBIAC)	1986	Chemical Warfare and Biological Defense Science & Technology (USACRDEC)	DLA Contractor
Crew Systems Ergonomics Information Analysis Center (CSERIAC)	1988	Man-Machine Interaction Including Human Factors Design Considerations (AFWRDC/AAMRL)	DLA Contractor

During this period, several Centers were disestablished or combined with other existing Centers as their use declined or DoD technology thrusts shifted. Among the Centers disestablished or combined were the Thermophysical Properties Information Analysis Center, Shock and Vibration Information Analysis Center, and Machinability Information Center.

In 1971, contract administration and funding responsibilities for eight Information Analysis Centers were shifted from the military departments to the Defense Supply Agency.⁴ In addition, policy formulation and oversight for the entire DoD Information Analysis Center Program were vested in the Office of the Director of Defense Research and Engineering. Each Center established since 1971 has been created following a period of

⁴ See Memorandum from DDR&E, John S. Foster to Director, Defense Supply Agency. "Department of Defense Contractor Operated Information Analysis Centers," 7 April 1971.

extensive study and analysis of the requirements for such centers. Among the issues considered prior to the establishment of such centers was the need for information analysis, the requirement of the three services for generic as opposed to service-specific support, and the willingness of the R&D community to provide financial and technical support to the Centers, if established.

B. IDA TASKING

1. Scope of Work

In 1986, IDA was asked by the Office of the Director for Defense Research and Engineering for Research and Advanced Technology to undertake a study of DoD Information Analysis Centers. The study had three objectives:

- Identify and quantify if feasible the benefits to DoD of operation of DoD Information Analysis Centers;
- Document identified benefits in a manner suitable for program and budget justification; and
- Identify strengths and weaknesses in IAC program operation and management, and make recommendations for changes to increase the benefits of the DoD IAC program to DoD.

The intent of the IDA task was to conduct a measured, thorough review of the DoD Information Analysis Center Program. During preliminary discussions with the Office of the Deputy Under Secretary of Defense for Research and Advanced Technology, the initial purpose of the review was viewed as an examination of the desirability of the DoD Information Analysis Center Program for the DoD R&D program. This was to be accomplished by

- Assessing the collective and individual IAC contributions to the DoD research, development, engineering, and test program;
- Identifying those IACs that were performing well;
- Identifying those IACs which were performing on the margin; and
- Identifying those IACs which had outlived their programmatic utility.

As discussions with R&AT continued, it became clear to both IDA and R&AT that the IDA study could not simply jump off with a program evaluation. The study would first have to develop a methodology which would give all participants in the program--from the IACs, to the DoD sponsors of IACs, to the IAC Program Office and its management within

the Defense Technical Information Center, and Headquarters, Defense Logistics Agency--confidence in the judgments reached by both IDA and R&AT. In addition, the study would have to provide quantitative information for presentation to Congress in support of increased funding for the DoD Information Analysis Center Program if increases were found to be warranted.

Thus, the statement of work prepared by IDA and approved by R&AT contained several steps in the study. In addition, R&AT, DTIC, and IDA agreed that some sort of preliminary assessment of the program based on a sample of IACs would be helpful to the ongoing resource allocation process. In addition, IDA and R&AT expected close coordination between the IDA study and an ongoing effort within DTIC which sought to assess the impact of the IAC program on DTIC operations and effectiveness.

As a result of these discussions, IDA was given a task order containing four subtasks:

Subtask A: Work plan;

Subtask B: Pilot Study intended to sharpen the methodology to be used in the overarching study;

Subtask C: Representative Sample as input for resource allocation discussions for FY 1989; and

Subtask D: Complete study of 12 DTIC-administered IACs.

In addition to the subtasks above, the Fiscal Year 1989 task order added an additional Subtask E requiring IDA to examine alternative mechanisms to fund core IAC programs.

2. PILOT STUDY

The second phase of the IAC Program Evaluation study was a pilot study of a single IAC selected jointly by the sponsor and IDA staff. The pilot study developed a general methodology and identified information requirements on which further assessments of additional IACs were to be built.

Among the issues examined during the course of the pilot IAC study were the following:

- How does DoD policy assist or impact the IAC's DoD technical monitor's options for using and supporting the IAC within his program?

- How does the DoD technical monitor incorporate the IAC into his R&D program?
- How does the DoD technical monitor provide guidance to the IAC and the DoD user community?
- How does the DoD technical monitor determine and structure the funding support for the IAC, including but not limited to the allocation of funding sources among core and other IAC services?
- How does the technical monitor track and evaluate the performance of the IAC?
- Which products and services of the IAC are of direct benefit to the DoD technical monitor; how are these products and services used; how are they "valued" by the DoD technical monitor?
- How effectively are the individual IACs administered and managed by the Defense Logistics Agency and its field activities?
- How do the Defense Technical Information Center and the Defense Electronics Supply Center support the DoD Information Analysis Center Program?

In addition to examining the IACs from the perspective of the DoD technical monitor, the pilot study examined the IAC from its own perspective. Among the questions explored were the following:

- What is the IAC role in mission/program oriented research?
- What changes to that role might be made?
- How does the source and method of funding the IAC influence the focus of its effort, allocation of its resources, and nature of its products and services?
- What is the known utilization of IAC products and services?
- What changes would increase the use of IAC products and services?
- What is the impact of the DoD accounting system and other DoD management systems on the ability of the IAC to perform its mission?
- What formal and informal mechanisms are used by the IAC to assess the degree to which its products and services are meeting the scientific and technical information requirements of its user community?

Finally, the pilot study developed methods of data collection and analysis needed to evaluate the effectiveness of the IAC from the perspective of the DoD and DoD-contractor user community. Among the questions explored were the following:

- How satisfied with IAC products and services are DoD and military department program managers?

- How might the IAC better meet the needs of DoD and military department program managers?
- What IAC products and services might DoD and military department program managers forego in order to have their program needs better met?
- How satisfied with IAC products and services are DoD contractors?
- How might the IAC better meet the needs of DoD contractors?
- What steps might the IAC take to improve its responsiveness to changing DoD contractor needs and requirements?

The pilot study was completed in draft in the spring, 1988, and circulated within OSD for comment.⁵ In addition, the pilot study was widely briefed to various interested components of the IAC community including the Director of the Defense Technical Information Center and his IAC Executive Council; the Director of Technical Services, Defense Logistics Agency; the annual IAC Business Meeting; and the Commander of the Defense Electronics Supply Center.

In July, 1988, the pilot study was presented to Dr. George Millburn, the Deputy Director for Defense Research and Engineering for Research and Advanced Technology and senior members of his staff. As a result of this briefing, it was determined that IDA should proceed with the selection of a representative sample of Information Analysis Centers funded and administered by the Defense Logistics Agency and continue its efforts to develop and apply a method to arrive at a benefit-cost ratio for each DoD IAC and the IAC program as a whole. IDA was further directed to make observations on the administration, management, and oversight of the program and to identify alternatives that might improve the efficiency and effectiveness of the IAC program in support of R&AT research and engineering efforts. Finally, IDA was directed to evaluate alternatives based on the pilot study and the representative sample and include preliminary recommendations for program reorientation in the report on the representative sample of DoD IACs.

3. Representative Sample

A set of "representative" IACs was selected in consultation with the sponsor during July, 1988. While the specific IACs selected will be described in greater detail below, the selection process was guided by several important considerations related to the revised

⁵ Edwin S. Townsley and Forrest R. Frank, *Evaluation of DoD Information Analysis Centers: Pilot Study* (Alexandria, VA: Institute for Defense Analyses, Memorandum Report M-443, 1989).

direction provided by IDA by Dr. Millburn and his senior staff. Two somewhat different but related purposes were to be served by the examination of a representative sample of DoD IACs:

- Continue efforts to establish individual and aggregate IAC benefit-cost ratios; and
- Compare and contrast the administration, management, and oversight of DLA-sponsored IACs with other IACs sponsored by other DoD components to determine if any differences among their administrative and management practices had significant impact on the ability of IACs to meet the goals and objectives of the DoD research and engineering program.

On the basis of the pilot study, several factors were identified that might have some bearing on the development of a benefit-cost ratio for a DoD IAC. We therefore sought out IACs to be included in our representative sample that were substantially different in certain respects from Nondestructive Testing Information Analysis Center (NTIAC) to see whether or not those differences might have some bearing on the ability to identify and then quantify benefits and costs to the DoD research and engineering program arising from an IAC or the IAC program as a whole.

Our review of the NTIAC users disclosed a very large customer base outside the DoD research and development community. We therefore sought out IACs which had a very strong R&D user base, with a considerable number of special tasks funded out of appropriation category 6.1 through 6.3A funds.

The technology area included in the cognizance of NTIAC is predominantly unclassified. We sought to include IACs in our representative sample that did a significant portion of their core and special task work in classified or export controlled areas of information.

NTIAC has a relatively long institutional history, having originally been established as a government-operated IAC within the Army Materiel Command and housed at Watertown Arsenal. We therefore sought to include in our pilot study a relatively young IAC.

The pilot IAC evaluation study of NTIAC also identified several institutional factors which might have some bearing on the identification and quantification of benefits on the one hand, or the operation of the IAC from the perspective of the users on the other. Thus, we sought to include in our representative sample at least one IAC which was independent of Defense Logistics Agency sponsorship in order to understand the range of impacts DLA

sponsorship might have for the operation, management, and oversight of the IAC and its ability to meet the requirements of its user community.

This report examines the benefits provided by three DoD Information Analysis Centers--the Chemical Warfare/Biological Defense Information Analysis Center, the Tactical Weapon Guidance and Control Information Analysis Center, and the Reliability Analysis Center--to DoD. In the following chapters, the IAC program goals, objectives, and operations will be summarized, the study methodology reviewed, and the benefits to DoD identified by in-depth review of IAC activities reported.

A second report available to U.S. Government personnel and other eligible readers describes the operation of the IAC program in greater detail, summarizes IAC program administration, management, and oversight strengths and weaknesses identified during this phase of IDA's study, and sets forth recommendations for changes in program operations to address weaknesses identified.

C. SUMMARY

In this chapter, the reader has been introduced to the history of the DoD IAC Program and the IDA task, "Evaluation of DoD Information Analysis Centers Program." In the balance of this report, the reader will be further acquainted with the DoD IAC program, the selection of three additional IACs for further detailed review, and the benefits provided resulting from the use of CBIAC, GACIAC, and RAC by DoD components, other U.S. Government agencies, and DoD contractors.

2. INFORMATION ANALYSIS CENTERS

A. IAC FUNCTIONS

DoD Regulation 3200.12-R-2, "Centers for Analysis of Scientific and Technical Information Regulation,"⁶ defines a DoD Information Analysis Center as follows:

A formal organization with a primary mission to acquire, digest, analyze, evaluate, synthesize, store, publish, and provide advisory and other user services concerning available worldwide scientific and technical information and engineering data in a clearly defined, specialized field or subject area of significant DoD interest or concern. Information Analysis Centers (IACs) are distinguished from technical information centers and libraries whose functions are primarily concerned with providing reference or access to documents themselves rather than the information contained in the document.⁷

In order to perform these functions, IACs are required by policy and by contract to have certain capabilities and additional associations with other entities in order to fulfill their information collection and analysis functions. The basic Defense Logistic Agency contract for an IAC specifies the following:

An information analysis center has the capability to prepare authoritative technical reference works (i.e., handbooks, data books, state-of-the-art reports, etc.), perform special tasks or studies, provide analytical support to its user community, and provide authoritative responses to user inquiries. This Center must have immediate access (on a part-time or full-time, as-needed basis) to scientific and engineering expertise (available either in-house or under contract) in the range of subjects and disciplines within the Center's scope of work.⁸ While an IAC contains elements of a library, it is intended to provide substantive, analytical services which go beyond functions usually performed by

⁶ See Appendix A.

⁷ Office of the Under Secretary of Defense for Research and Engineering, Washington, DC, January, 1985, p. 1-1.

⁸ See "Statements of Work" for the following Information Analysis Centers: Data and Analysis Center for Software (DACS), Paragraph 3.2.6; Tactical Weapon Guidance and Control Information Analysis Center, Paragraph 9.9; Metals and Ceramics Information Center (MCIC), Paragraph 8.1; Metal Matrix Composite Information Analysis Center, Paragraph 8.9; and Reliability Analysis Center (RAC), Paragraph 3.3.9.

libraries on a regular basis.⁹ For example, libraries acquire, store, and catalog information. Libraries also lend materials to their users. Some libraries add a current awareness program, frequently consisting of regular or periodic announcements of current acquisitions.

An IAC, on the other hand, typically undertakes far broader activities subsuming many of those performed by a library. In addition to acquiring, cataloging, indexing, and storing scientific and technical information in its field in documentary form, an IAC frequently seeks out non-documentary forms of information. Several DoD IACs acquire films, experiment records, and raw experiment data in the form of data tapes, research notes, and preliminary analyses of data. Other IACs also design, build, consolidate, maintain, and disseminate data bases. These are functions which are not usually associated with a library, which by DoD regulation is only concerned with the collection, storage, and retrieval of documents or other sources of information, not the information contained therein.¹⁰

DoD IACs also prepare abstracts of information collected. These abstracts are placed in data bases accessible to DoD and its contractor community through electronic, telephonic, written, or personal inquiry. In addition, several DLA/DTIC sponsored data bases are installed in whole or in part on the DTIC mainframe computers and can be accessed through the Defense Technical Information Center Defense Research On-Line System (DROLS). DoD IACs are barred by DoD regulation from secondary distribution of

⁹ The Committee on Scientific and Technical Information suggested the following definition:
An Information Center is a formally structured organizational unit specifically (but not necessarily exclusively) established for the purpose of acquiring, selecting, storing, retrieving, evaluating, analyzing, and synthesizing a body of information in a clearly defined specialized field or pertaining to a specified mission with the intent of compiling, digesting, repackaging, or otherwise organizing and presenting pertinent information in a form most authoritative, timely, and useful to a society of peers and management.

In 1979, Carroll and Maskewitz have suggested the following description of an Information Analysis Center:

...staffed mainly with scientists and engineers, who first index and then compile, analyze, evaluate, condense, extrapolate, and/or synthesize information in a given area as integral steps in a comprehensive information acquisition, storage, retrieval, and dissemination process for the benefit of the scientific community to which they belong.

quoted in DTIC/TR-87/17, *op. cit.*, p. 4.

¹⁰ See DTIC/TR-87/17 *op. cit.*, for description of acquisition activities of various DOD IACs; see especially description of acquisition efforts by the Survivability/Lethality Information Analysis Center (SURVIAC), the High Temperature Materials Information Analysis Center (HTMIAC), and the DoD Nuclear Information Analysis Center (DASIAC) regarding the acquisition of nondocumentary forms of scientific and technical information.

reports generated by others; they are permitted to publish and to disseminate their own work. Storage of information at IACs is oriented to meeting the needs of IAC staff, not the general user community.

DoD IACs maintain current awareness surveillance of their fields of expertise. Each IAC carries out this function in its own way.

A crucial difference between an IAC and a library is the quality of information provided to users. Libraries provide users all information that is available and that falls within the domain of the request. IACs, on the other hand, provide information that has been substantively evaluated, digested, and judged against the standards of the field on the one hand, and the needs or requirements of the requester on the other.

Another important difference between an Information Analysis Center and a library is in the provision of technical analysis services. The DoD IACs have been established to provide a center of expertise which can be tapped by DoD components, the military departments, and the DoD contractor base to provide answers to technical questions within a given field. As will be documented in greater detail below with examples from several IACs, technical analysis services can range from providing a simple referral to an expert in the field, to the preparation of a short technical memorandum, to the conduct of a large, technical study. Figure 2-1 summarizes the differences between an information analysis center and a library.

The basic functions of an IAC remain fixed in contract even though the characteristics of the disciplines included in a DoD Information Analysis Center may cause minor variations in the specific products and services to be provided by a DoD Information Analysis Center. Each IAC contract administered by the Defense Logistics Agency (DLA) provides for two types of products and services. Core products and services are provided by the IAC in exchange for financial support by DLA. Special studies and tasks are established in principle by the basic DLA contract, but are specifically ordered and paid for by a sponsoring military department, DoD agency, military activity, or other federal government agency. Each of these is described below.

		IACS	LIBRARIES
ACQUISITIONS	BOOKS	X	X
	JOURNALS	X	X
	PAPERS	X	X
	DATA SETS	X	
	RESEARCH NOTES/DATA	X	
	RAW DATA	X	
CATALOG	CATEGORIZE INFORMATION	X	X
	INDEX	X	X
STORE	ARCHIVE	X	X
	STORE FOR CIRCULATION		X
	STORE FOR SELF USE	X	X
DIGEST/ANALYZE	ABSTRACT	X	X
	ASSESS SIGNIFICANCE	X	
	ASSESS METHODOLOGY	X	
	TECHNOLOGY ASSESSMENTS	X	
	STANDARDIZED METHODOLOGY	X	
	STANDARDIZED DATA SETS	X	
SYNTHESIZE	ANNOTATED BIBLIOGRAPHIES	X	X
	ANNOTATED DATA SETS	X	
	MODELS	X	
PUBLICATION/ CURRENT AWARENESS	ACQUISITION LISTS	X	X
	NEWSLETTERS	X	X
	STUDIES/ANALYSES	X	
	STATE-OF-THE-ART REPORTS	X	
	CRITICAL REVIEWS	X	
	HANDBOOKS	X	
ADVISORY SERVICES	REFERENCE INQUIRIES	X	X
	REFERRALS TO EXPERTS	X	
	TECHNICAL INQUIRIES	X	
	RESEARCH METHODOLOGY	X	
	INSTRUMENTATION/DATA		
	COLLECTION ADVICE	X	
OTHER USER SERVICES			
	CONFERENCE SUPPORT	X	
	CONFERENCE PROCEEDINGS	X	
	SPECIAL STUDIES AND TECHNICAL REPORTS	X	

Figure 2-1. Comparisons of Information Analysis Centers and Libraries

B. CORE PRODUCTS AND SERVICES

In the case of the DoD IACs funded in part by DLA, the core activities consist of the basic IAC products and services which establish and sustain the center of excellence. Examples of core products and services include the following classes of IAC activities:

- Maintenance of an information support system including but not limited to acquisition, cataloging, abstracting, and indexing documents and other forms of technical information; maintenance of bibliographic data files, inventories of the relevant technologies used within the technical community; development and maintenance of existing information retrieval and storage capabilities/technologies;
- Preparation of bibliographies;
- Critical analysis and evaluation of each additional information item added to the data base to assess its significance and impact on the field;
- Preparation of critical reviews and technology assessments;
- Preparation of authoritative technical reference works as specified in the contract which may include but are not necessarily limited to handbooks, data books, state-of-the-art reports, and software models; and
- Preparation of current awareness materials including but not necessarily limited to newsletters, announcements of publications, R&D events, conferences, or other information needed to keep a community aware of the most current developments within its field of expertise.

These functions and the products and services resulting from their performance are intended to perform at least three distinct functions for DoD:

1. Maintain and expand a knowledge base in an area, discipline, or technology of interest to DoD;
2. Develop and sustain a center of excellence which can be made available to DoD components, military departments, and DoD contractors on short notice to address technical questions in a low cost, time-sensitive manner;
3. Assist DoD research and development program managers in identifying and assessing areas of technology in need of further effort by DoD in order to meet its military operational, maintenance, reliability, or logistical requirements.

The core task component of a DoD IAC contract is usually funded by the Defense Logistics Agency through the Defense Technical Information Center. In the following chapters we will report on three IACs whose core program is funded by DLA; a fourth IAC is supported by funds provided by another DoD component. The core task and the

products and services required of an IAC are intended to provide both function and resources for the IAC that establishes and sustains a critical mass of capability and services. The IAC's core program is the basis for the capability and the reputation of the IAC as a Center of Excellence in its discipline or mission area. These capabilities and reputation, in turn, serve to attract additional tasks funded directly by the military departments, Defense agencies, OSD, or other agencies of the U.S. government.

Several DoD IACs have also begun to offer "block funded" products and services in recent years. These products and services are similar to those funded under the core; they are provided by the IAC to one or more users who agrees in advance to fund under a separate arrangement specific products or services which are similar to those provided by the IAC to core users. "Block funded" products may be provided to a single user for a single fee, or may be provided to multiple, specific users, under an arrangement in which several users agree to the "pooling" of their resources so that an IAC may undertake a larger effort on their collective behalf than would be possible to undertake for each user seeking to sponsor an analysis effort on its own.

Block funded products and services are often described by the IAC Program Officer as though they were core products or services. While block funded products and services resemble handbooks, data books, state-of-the-art reports, critical reviews, and conferences which might be appropriate for core fund support, they are really examples of the second category of IAC analyses and activities.

C. SPECIAL TASKS

The DoD Information Analysis Center Regulation and its implementing contracts provide for special studies and analyses of information tailored to individual requirements of specific U.S. Government agencies on a task order basis. The special studies and tasks must fall within the contract scope of the basic contract as determined by the Contracting Officer subject to the advice of the Contracting Officer's Technical Representative or Contract Technical Monitor.

Special studies and tasks generally involve the preparation of a study or an analysis on the basis of specialized data or information base and on the expertise resident at the IAC. Such expertise may take the form of an expert staff member, an expert available to the IAC through association with the IAC's parent organization, or the ability of IAC staff to search its collection of data, supplement existing data from other sources, and analyze information in the context of the requiring agency's specific need. Special studies or special tasks are

undertaken on a cost reimbursement basis upon the approval of the IAC COTR/CTM and upon receipt of funds by the Procuring Contracting Officer's agency from the requiring U.S. government organization.

As will be described in greater detail, special studies and tasks make up the bulk of the information analysis work undertaken by each IAC included in the representative sample study. The special studies and tasks cover a broad spectrum of information activities. Some special studies and tasks have included the preparation of a state-of-the-art report or critical review on a particular technology or analytical technique for a specific DoD component. The result of this effort has frequently been included in the IAC collection and made available to other IAC users. Other special studies and tasks have involved the analysis and synthesis of information leading to knowledge in new forms. IACs have been asked to collect and analyze data to verify that data reported in existing literature was actually generated using the methods reported. IACs have been asked to develop new analytical techniques or data collection methods to obtain data similar to that reported in the literature at lower cost or with greater reliability. IACs have been asked to expand existing data bases or knowledge bases in order to take advantage of the economies of scale that arise when adding increments to existing information bases.

The benefits to DoD of several IAC special studies and tasks are described in Chapters 4, 5, and 6 of this report, as well as in the earlier IDA pilot IAC study.¹¹

D. IAC PROGRAM DEVELOPMENTS, FY 1987-FY 1989

1. Funding Profile

Over the past few years, the DoD Information Analysis Center Program has not enjoyed consistent executive or legislative support for stable or increasing levels of funding. Table 2-2, based on figures compiled by the IAC Program Office within the Defense Technical Information Center, illustrates the lack of consistent budget support from either the Department of Defense or the Congress. The IAC Program has been subjected to reductions in the programmed level of support within the internal DoD funding cycle. In addition, the Congress has also imposed additional reductions in the program's budget during the course of its review of the DoD budget. These conscious reductions in the IAC Program's budget have been further exacerbated as the result of undistributed

¹¹ See especially "Chapter VII: Benefit Considerations," in Townsley and Frank, *op. cit.*, pp 63-95.

reductions in R&D programs not otherwise protected from such reductions by OSD directive or other executive action.

**Table 2-2. DoD Information Analysis Center Program
Recent Budget History for DLA Funded IACs***

(in millions of current dollars)

Fiscal Year	Number of IACs Funded	Planned Program	Requested DoD Program	Appropriation	Actual Outlay [#]
1980	8	\$4.0	\$4.0	\$3.64	\$3.64
1981	9	3.9	3.9	3.64	2.982
1982	8	3.992	3.992	3.613	3.2
1983	9	5.3	5.3	4.0	4.0
1984	10	7.0	7.00	4.934	4.5
1985	11	5.75	5.75	5.75	5.75
1986	11	6.550	6.550	6.550	4.075
1987	12	7.926	7.0	5.0	4.579
1988	13	8.6**	5.2	5.175	4.883
1989	13	7.398	5.2	5.2	5.2***
1990	13	7.776****	6.2****		

* DTIC budget planning records for FY 1988-1991 dated 15 November 1988.

Reflects available funds following a distribution of "unallocated" reductions in available RDT&E funds due to end of year and Gramm-Rudman-Hollings budget adjustments.

** Includes start-up funds for an IAC procurement which was canceled due to lack of appropriated funds.

*** Estimated outlay at conclusion of current fiscal year.

**** Estimate based on 5 percent growth over previous fiscal year.

In Table 2-2, the column Planned Program refers to funds required to meet the core programs anticipated by DoD at the time the contract for basic IAC services was concluded by DLA, by other military departments relying DLA funding for their IAC contract funding, plus additional sums for new IAC starts and IAC program management activities. Contract requirements for core funding reflect the judgment of an IAC's proponent and DDDR&E as to the minimum level of core service to be provided by the IAC at the time an IAC is authorized. The Planned Program column may also include funds for program management and oversight. In the past program management funds have been allocated to pay some COTR support costs associated with IAC Program meetings or other activities of the DoD IACs. Such funds have also been allocated to pay for at least a portion of special DTIC efforts to publicize or market DoD Information Analysis Centers.

The column labeled Requested DoD Program is the level of funding requested by DoD in its annual consolidated budget submission to the Congress. The column labeled Appropriation (As Adjusted) refers to the final appropriated dollar amount for the program plus or minus such reprogrammings specifically agreed to or accepted by the Congress. It is an end of Fiscal Year figure. The last column, Actual Outlay, records the amount of funds expended by DLA in support of the program. This last column shows the impact of unallocated reductions in DoD funding when programs are not protected from such reductions by direction of the Secretary of Defense.

The data show that the IAC Program is operating today in terms of outlay at about the level anticipated by the program in the early 1980s. Based on data collected from interviews with IAC Directors and IAC users, the gap between requested funding and actual funding appears to have had a significant, adverse impact on IAC program activities.

In addition to the general weakness in core funding support, the Department of Defense and the Congress have failed to support existing IACs at the same level in constant dollar terms as was the case in FY 1971. Table 2-3 illustrates the long term effect of inflation on the DoD IAC program.

In FY 1971, the IAC program was funded at \$2.3 million. Of this amount, some \$1.880 million was spent at IACs which exist today or which have direct successors who perform similar functions. These figures translate into FY 1990 dollars at approximately \$7.2 million for all IACs in existence in 1971 and \$5.778 million for those which continue to exist in one form or another in FY 1990.

During the period FY 1972 through FY 1988, several new IACs were added to the DoD Information Analysis Centers Program. In some instances, these IACs were formed by consolidating operations from several IACs into one new IAC; in other cases, new IACs were formed to meet the needs of emerging DoD technology thrust areas. A small number of DoD IACs were disestablished.

The data presented in Table 2-3 show that DLA would have to substantially increase the proposed level of funding in FY 1990 from \$6.2 million to approximately \$12.4 million if it wished to provide the IACs with the same level of constant dollar (buying power) support they enjoyed in FY 1971 or in the fiscal years during which younger IACs were started. This level of support is needed to sustain the DoD Information Analysis Centers Program at the level for each IAC as envisioned by its proponent or by DDDR&E at the time it approved the establishment of the DoD IAC under a DLA contract.

**Table 2-3. IAC Buying Power:
FY 1971, Year of Start Up, and FY 1990***

IAC	FY 1971 In FY 1971 \$	Initial Year in Then Year \$	FY 1990 Funding to Retain FY 1971 or Start Up Buying Power**
IAC Program Program	\$2,334,000		\$7,177,121
MCIC	\$730,000		\$2,244,772
TEPIAC (HTMIAC)	\$405,000		\$1,245,387
RAC	\$300,000		\$922,509
CPIA	\$290,000		\$891,578
IRIA	\$155,000		\$476,629
NTIAC		1974 \$400,000	\$1,059,602
GACIAC		1977 \$375,000	\$747,905
DACS		1978 \$550,000	\$1,023,636
MMCIAC		1980 \$590,000	\$914,728
MTIAC		1984 \$500,000	\$606,354
SURVIAC		1984 \$750,000	\$309,531
CBIAC		1986 \$500,000	\$571,689
CSERIAC		1988 \$750,000	\$807,493
TOTAL IAC PROGRAM FY 1990 COSTS AT FY 1971/START UP BUYING POWER			\$12,421,813
TOTAL IAC PROGRAM PROPOSED BY DLA FOR FY 1990			\$8,200,000

* Based on "Information Analysis Centers Five Year Plan, Fiscal Years 1973-1980," Defense Supply Agency, 1 August 1974, and "Direct Core Funding by Fiscal Year," Information Analysis Center Program Office, Defense Technical Information Center, October 24, 1989.

** Conversion Factors extracted from "National Defense Budget Estimates for FY 1990/1991," Office of the Assistant Secretary of Defense (Comptroller), March 1989, p. 52 (RDTE column) used were as follows:

From	to FY 1990	From	to FY 1990
FY 1971	32.52	FY 1984	82.46
FY 1974	37.75	FY 1986	87.46
FY 1977	50.14	FY 1988	92.80
FY 1978	53.73		
FY 1980	64.50		

The lack of financial support for the DoD IAC core program has had significant consequences for both the IACs and the DoD research and engineering programs they are intended to support. Among the adverse consequences for the program mentioned were:¹²

- Reduced production of handbooks, state-of-the-art reports, and other similar reference works;
- Poor morale and resulting low productivity at individual IACs;
- Significant delays in the production of reference materials and other core products;
- Significant reduction in the level of effort devoted to the collection, cataloging, indexing, and maintenance of core collections in favor of more lucrative, but perhaps more specialized, collections supporting special tasks.

The IAC Directors and others familiar with the program argue that these consequences of reduced funding for the core IAC program have adversely impacted the DoD's research and development program. The inability of the IACs to maintain the currency of their data bases, and reference works derived from them, undermines their value to the user community in several ways. Outdated reference works increase costs of getting information into the hands of users within DoD and its contractor community. This in turn impedes the transition of innovative scientific and technical developments from the laboratory to engineering development, test, and production. As a consequence, the acquisition cycle is extended. In certain areas where IAC handbooks are used as standards, as in the case of aerospace structural materials, the use of outdated information can actually impede the growth and development of technology thrusts of great interest to DoD.

During this phase of our evaluation of DoD Information Analysis Centers Program, we spoke with several DoD scientists and engineers who had used one or more DoD IACs over a period of years. Several expressed the view that the decline of support for core IAC programs was hindering their individual research and engineering activities.

The issue of IAC effectiveness has become pressing over the past few years because of several concurrent trends. Funding levels have not kept pace with inflation, putting a squeeze on the ability of IACs to maintain a critical mass of people, facilities, and information. At the same time, the technological content of weapon systems has increased. Interest in establishing IACs by various military components or DoD Agencies has also

¹² See Mr. L. Gonzalez, Director, Metal Matrix and Composites Information Analysis Center, "Impacts of Budget Reductions in the Core Funding on Operations at the MMCIAC," October, 1986.

increased, despite the reduction in buying power of the DoD Information Analysis Center program measured in terms of available core funds.

2. New Starts

During the early 1980s, two new Information Analysis Centers were initiated with minimal DTIC financial support because of a strong need on the part of the military departments and/or other DoD agencies for such support. The Survivability/Vulnerability Information Analysis Center (SURVIAC) was started because of concern by the Joint Technical Task Group on Aircraft Survivability over the lack of standardized models of aircraft vulnerability and munitions effectiveness against different types of airframes and aircraft components. Several activities including the maintenance of existing data bases were combined into SURVIAC in order to provide better support to the aircraft design community. The Chemical Warfare/Biological Defense Information Analysis Center was started to capture and make available existing research and development results in the field, preserve research results of special historical significance, and assist DoD in the collection, synthesizing, and dissemination of information bearing on the conduct of operations in a battlefield contaminated by nuclear/biological/chemical agents.

In these instances substantial commitment of funds by the military departments was made to initiate and sustain core information analysis center programs for an initial period of time with the expectation that DLA/DTIC would assume its role in providing continuing support from the DoD Information Analysis Center Program Element. Unfortunately, the funding level of the DLA/DTIC program was not expanded to provide full funding as provided by contract with the established IAC program and provide full contract support to new IACs as well. As a result, the establishment of new IACs in the DoD IAC program occurred at the expense of at least a portion of core funding for existing IACs.

In fiscal year 1988, the DoD IAC program added the Crew Systems Ergonomics Information Analysis Center. This center, operated by the University of Dayton, is intended to provide vehicle design engineers with the basic information needed to improve the man-machine interface in all vehicles designed for use by U.S. and allied armed forces.

The IDA study team had an opportunity to observe a thoroughgoing review and debate within the IAC Executive Council, an advisory body to the Administrator of the Defense Technical Information Center, on the merits of proceeding with the procurement of this new IAC on at least two occasions during the period just prior to the announcement of the solicitation. The principal reservations voiced by members of the IAC Executive

Council regarding the establishment of a new IAC was the adverse impact a new IAC would have on the resources available to existing IACs.

3. Desired New Starts/Restarts

In addition to SURVIAC, CBIAC, and CSERIAC, which have all begun operations during a period in which the DoD IAC program budget remained flat, there have been ongoing discussions of the expansion of the existing IAC program. There has been interest in the reestablishment of one IAC which has been disestablished (Shock and Vibration Information Analysis Center). DTIC completed all but the award phase of a new IAC in the field of corrosion in FY 1987 but had to withdraw the procurement due to a lack of funds. DoD is experiencing continuing demand from the military departments for information analysis support to combat the effects of corrosion on military equipment. This need continues to be unmet. Discussions with DoD staff suggest continuing interest in an information analysis activity to provide support in such areas as electronics, materials, robotics, artificial intelligence, and several other areas of promising advanced technology of interest to one or more DoD components.

The military departments desiring to establish new IACs in the future may follow the CBIAC and CSERIAC models. In these instances the services put up the bulk of the funds necessary to fund the core operations of the IAC for the first two years, and may continue to do so long after the time when DLA has traditionally picked up IAC funding in its budget line item. If the new IACs desired by the military departments are started within the current fiscal and budgetary regime, the result will be further dilution of DoD IAC program funds across an expanded set of DoD IACs.

E. THE REPRESENTATIVE SAMPLE OF DOD IACS

This report examines three DoD Information Analysis Centers to develop and apply further a study methodology that permits the evaluation of the benefits and costs of DoD Information Analysis Centers and their contribution to the DoD research and engineering program. In the following chapter, the method by which CBIAC, GACIAC, and RAC were selected for review and the process of detailed review of IAC benefits will be discussed.

3. REPRESENTATIVE IAC SAMPLE STUDY METHODOLOGY

A. OPERATIONAL AUDIT APPROACH

The basic methodology applied by IDA to the evaluation of the DoD Information Analysis Centers Program borrows heavily from techniques used to conduct performance audits by various auditing agencies of the U.S. Government.¹³ The approach was tested in IDA's pilot IAC study and was found to be an effective mechanism to gather information needed to assess the benefits of IAC products and services. In addition, the operational audit approach also permitted the collection of information needed to evaluate the efficiency and effectiveness of IAC contract administration, management, and program oversight.

The basic approach taken by IDA in both the pilot study and the representative IAC sample study was as follows:

- Identify program goals and objectives as articulated by DoD directives, policy statements by authoritative DoD spokesmen, and senior program managers,
- Identify or develop appropriate quantitative and qualitative measures of merit to be used in assessing the cost, benefit, effectiveness, and performance of individuals and organizations participating in the management, oversight, operation, and evaluation of the DoD Information Analysis Center Program,

¹³ See especially *Policy and Procedures Manual for Guidance of Federal Agencies: Title 3: Audit* (Washington, DC: U.S. General Accounting Office, no date) and *Government Auditing Standards (1988 Revision)*, (Washington, DC: U.S. General Accounting Office, 1989). For additional discussion of operational or performance audits, see the following references: Darwin J. Casler, James R. Crockett, and Richard Holman, Editors, *Operational Auditing: An Introduction* (Altamonte Springs, FL: Institute of Internal Auditors (1982); Dale L. Flesher and Steward Siewert, *Independent Auditor's Guide to Operational Auditing* (New York: Wiley, 1982); Bradford Cadmus and J. Arnold Beale, *Operational Auditing Handbook* (Altamonte Springs, FL: Institute of Internal Auditors, 1964). In addition, see the following articles for discussions of operational auditing of activities which are relevant to the method used in this study: J.J. Dalton, "The Operations Review Process: An Independent Evaluation of Performance," *Topics in Health Care Financing*, Vol. 10, No. 2 (Winter 1983), pp. 22-28; R.J. Knoll and T.N. Howard, "What Is Operational Auditing?," *Topics in Health Care Financing*, Vol. 10, No. 2 (Winter 1983), pp. 1-11; T.J. Gruber, "The Operational Audit--An Integrated Approach," *Internal Auditor*, Vol. 40, No. 4 (August 1983), pp. 39-42; J. Simke, "Management, Operational and Comprehensive Auditing: Extending Traditional Boundaries," *CA Magazine*, Vol. 115, No. 6 (June 1982), pp. 52-56.

- Develop questionnaires and other instruments needed to collect data bearing on the measures of merit appropriate to each organization participating in the management, oversight, operation, or evaluation of DoD Information Analysis Centers,
- Conduct interviews and review records, where appropriate, in order to collect data, and
- Analyze data collected during the field survey phase of the study.

Attempts by other U.S. Government agencies to develop methods for assessing the performance of their information analysis centers proved unsatisfactory as models for IDA. For example, the study done for the Department of Energy attempting to quantify benefits to DoE resulting from its scientific and technical information program (STIP) lumped all STIP activities together and derived an aggregate benefit measured in terms of billions of dollars. Many of these STIP activities differ from DoD IAC activities; furthermore, IDA concluded that the methodology used to compile dollar value of benefit was not reasonable if applied to the DoD IAC program.¹⁴

In the case of the National Science Foundation effort to assess its information analysis activities, IDA concluded that the range of DoD information management/information security controls as well as the general manner in which DoD IACs operate made the NSF study methodology an inappropriate model. While IDA sought to borrow analytical techniques as appropriate, the differences between NSF-sponsored IACs located at colleges and universities in 1974-1976 and DoD-sponsored IACs located at not-for-profit or for-profit institutions operating in the 1980s appear to be substantial.¹⁵

B. DEVELOPMENT OF INTERVIEW INSTRUMENTS

In order to better understand the operation and management of the DoD IAC program as well as the benefits and costs of the program to DoD and its contractors, IDA developed a set of questionnaires to be used in interviews for each of the major participants

¹⁴ King, Donald W., Jose-Marie Griffiths, Ellen A. Sweet, and Robert R. V. Wiederkehr, *A Study of the Value of Information and the Effect on Value of Intermediary Organizations, Timeliness of Services & Products, and Comprehensiveness of the EDB* (Rockville, MD: King Research, Inc. for Technical Information Center, Office of Scientific and Technical Information, United States Department of Energy, September 1984).

¹⁵ Robert W. Mason, et al., *Development of Cost Benefit Methodology for Scientific and Technical Information Communication and Application to Information Analysis Centers* (Atlanta, GA: Metrics Inc., for the National Science Foundation, SIS 75-12741, 1977) and *A Study of the Perceived Benefits of Information Analysis Center Services* (Atlanta, GA: Metrics Inc., for the National Science Foundation, DSI-7718035, March 1979).

in the IAC system as identified in the DoD Directive. Among the key actors for whom interviews were anticipated at the beginning of this study were the following:

- IAC Directors and their staffs
- IAC Procuring Contracting Officers
- IAC Contracting Officer's Technical Representative/Contract Technical Monitor
- DoD Program Monitors
- IAC Program Office
- IAC Core Activity Users
- IAC Special Task Users (Task Monitors)
- Administrator of DTIC
- The Director of Technical Services, Defense Logistics Agency
- The Executive Director of Contracting, Defense Logistics Agency
- Members of the Contract Review and Contracting Policy Staffs, Defense Logistics Agency
- Defense Electronics Supply Center staff responsible for DoD IAC activities
- Staff at the regional offices of Defense Contract Administration Services responsible for contract oversight and payment of DoD IAC contractors.¹⁶

A general questionnaire was prepared and was significantly tailored or modified to elicit information regarding the specific responsibilities of each individual for IAC programming, budgeting, operations, management, oversight, and performance evaluation. Each questionnaire was reviewed with the sponsor and further modified in order to elicit additional information that might be helpful in obtaining both direct and indirect evidence of costs and/or benefits of the IAC program to DoD.

IDA did not attempt to mail questionnaires to IAC Directors or IAC users for three reasons. First, we did not wish to subject the study to the uncertainties associated with Office of Management and Budget review and approval of survey instruments. Second, our experience in the pilot IAC study suggested that sterile mail surveys would be unlikely to elicit information most useful in understanding and quantifying the benefits provided to DoD and contractor users of Information Analysis Centers. Third, we were concerned that

¹⁶ Headquarters staff of the Defense Logistics Agency concerned with DoD Information Analysis Centers Program will be interviewed further during subsequent phases of this study.

a simple mail survey would not result in a statistically significant sample of IAC users. On balance, we concluded that the time and effort associated with detailed interviews with IAC program participants would result in the timely collection of more meaningful information than would mailed surveys.

In the case of both the IAC Director and the IAC COTR, we sought answers to questions which would illuminate the following subject areas from their respective vantage points:¹⁷

- What are the IAC Program goals and objectives?
- How does the Core program of the IAC fulfill these goals and objectives?
- How does the Special Studies and Special Tasks program of the IAC fulfill these goals and objectives?
- How is the IAC organized? How is the Defense Department organized to oversee and manage the IAC's contract?
- How is the IAC operated? How does the Defense Department carry out its oversight and contract management of the IAC's contract?
- What problems and opportunities for additional or alternative core and special tasks has the IAC encountered? What steps were taken and by whom to alleviate these problems and facilitate the provision of products and services by the IAC to the Defense Department, other U.S. Government agencies, Defense Department contractors, and other authorized users of IAC core products and services or special task services?

These questions were framed in large measure to help identify the specific benefits to DoD that had accrued as a result of either core or special tasks performed by the IACs included in our study. We sought to understand the conditions under which IAC products and services had been most helpful to DoD as measured by IAC users and/or DoD program managers whose programs were affected by IAC products and services.

As the study progressed, the range of interviewees broadened to include a considerable number of special task users as well as several consumers of core products and services.

¹⁷ See Appendix C for a copy of the basic questionnaire that was used to structure interviews with IAC Directors, IAC Technical Monitors, and IAC Special Task Users.

C. REPRESENTATIVE SAMPLE SELECTION CRITERIA

The purpose of conducting a study of a representative sample of DoD Information Analysis Centers was threefold:

- To apply a methodology developed in the pilot IAC study to examine the benefits and costs to the DoD research and engineering program;
- To assess specific benefits that had been obtained from the IACs examined; and
- To assess IAC program management and administration and set forth alternatives to improve the program if found to be warranted.

During May and June, 1988, IDA met with R&AT and the IAC Program Office staff to discuss a number of factors which might be significant in helping to judge the benefits and costs of the entire DoD IAC program to the DoD research and engineering program. Although the pilot study was still being circulated for comment within OSD, DLA, and DTIC, a consensus developed a sound set of criteria which could be used in screening remaining IACs for inclusion in the representative sample phase of the study. We were guided in our selection process by the concept that at least some IAC members of the representative sample should demonstrate characteristics in users, information acquired, organizational history, and relationships with the contracting process at variance with NTIAC. Among the more specific criteria used to screen the remaining IACs were the following:

- Focus of IAC not in the field of materials science
- IAC users from the research and engineering community, especially those funded from budget category 6.1 through 6.3A funds
- IAC work being performed substantially in subject areas subject to export controls and/or national security classification
- IAC in the initial contract period with the Defense Logistics Agency
- IAC with a Contracting Officer's Technical Monitor not on the OSD staff
- IAC whose Procuring Contracting Officer was not a DLA staff member.

In addition to these criteria which might have some bearing on the work of an IAC, our pilot study raised several questions about the defense of the IAC core program in the DoD budget process (including the Congress), the administration of the contract, and the role of various institutions in the oversight of IAC performance. Accordingly, we sought

and were granted permission to expand the scope of the study to include at least one IAC completely outside the existing family of DLA-sponsored or DLA-affiliated IACs.

After several conversations with R&AT staff, DTIC staff, and several IAC COTRs, four IACs were selected for inclusion in the sample to be examined in this phase of the overall study, Evaluation of the DoD IAC Program:

- Tactical Weapon Guidance and Control Information Analysis Center (GACIAC), operated under contract to DLA by IIT Research, Inc.;
- Chemical Warfare/Biological Defense Information Analysis Center (CBIAC), operated under contract to DLA by Battelle Memorial Laboratories;
- Reliability Analysis Center (RAC), operated under contract to the Air Force by IIT Research, Inc.; and
- DoD Nuclear Information Analysis Center (DASIAC), operated under contract to the Defense Nuclear Agency by Kaman Sciences-Tempo Division.

Each IAC selected exemplifies one or more characteristics which differentiate it from NTIAC, the object of the pilot study. Each also has much in common with other IACs.

GACIAC and CBIAC operate in areas of technology which are much more sensitive from an export control and national security information standpoint than does NTIAC. GACIAC and CBIAC do not have as well developed a user base in the maintenance and logistics fields as did NTIAC. Thus, it would appear that GACIAC and CBIAC users are more heavily weighted on the side of development and advanced engineering as opposed to operational test and evaluation or even logistics and maintenance users as was frequently the case in the NTIAC study.

GACIAC and CBIAC strongly resemble NTIAC from the standpoint of contracting administration and management. All three IACs operate under DLA contract with DLA supplying funds for the core IAC program. The Reliability Analysis Center represents an alternative model for the oversight and management of DLA funds. RAC is operated under an Air Force contract which is administered and managed by the same organization which also provides the Contracting Officer's Technical Representative. Unlike GACIAC, CBIAC, and NTIAC, the RAC has no formal point of contact on the R&AT staff. It is possible that these organizational and structural issues might bear on the efficiency and effectiveness of the IACs and their sponsor's oversight and management.

We included DASIAC in this study of representative sample IACs because it represents still another model for structuring an IAC contract, as well as administering, managing, and overseeing an IAC supporting an ongoing, sensitive, DoD research and engineering program. We did not explore with DASIAC users the kinds of benefits that resulted from its use. Accordingly, there will be no additional discussion of DASIAC in this report.

D. ADMINISTRATION OF SURVEY INSTRUMENTS

During the course of the pilot study, IDA staff made several trips to interview key individuals involved in the operation, oversight, and management of IACs included in the representative sample. Among those individuals interviewed specifically on the provision of IAC products and services were the following:

Mr. Frederick Menz, DDDR&E(R&AT)

Mr. Thomas Dashiell, DDDR&E(R&AT)

Mr. Howard Race, immediate past GACIAC Contracting Officer's Technical Representative

Mr. Chad George, GACIAC Contracting Officer's Technical Representative

Mr. Steve Lawhorne, CBIAC Contracting Officer's Technical Representative

Mr. Preston MacDiarmid, RAC Contracting Officer's Technical Representative

Mrs. Sandra Young, immediate past DASIAC Contract Technical Monitor

Dr. Robert Heaston, Director, GACIAC

Mr. Fran Crimmins, Director, CBIAC

Mr. Steve Flint, Director, RAC

Mr. Richard Rowland, former Director, DASIAC

Mr. Bruce Montoya, Rome Air Development Center, U.S. Air Force, Procuring Contracting Officer for RAC

Mr. H. Fillippi, Executive Director, Technical Services, Defense Logistics Agency

Mr. Kurt Mulhollin, Administrator, Defense Technical Information Center

Mr. Paul Klinefelter, Director, Information Analysis Center Program Office, Defense Technical Information Center

Mr. Brian McCabe, Information Analysis Center Program Office, Defense Technical Information Center

Mr. Michael Poppick, Contracting Directorate, Defense Logistics Agency

Mr. Richard Higginbotham, Contracting Directorate, Defense Logistics Agency
Mr. Nick McHenry, Contract Review Branch, Defense Logistics Agency
Ms. Kathy Calhoun, Contract Review Branch, Defense Logistics Agency
Col. Louis Diehl, Defense Electronics Supply Center
Lt. Col. Donald Haverkamp, Defense Electronics Supply Center
Ms. Sara Williams, Defense Electronics Supply Center and Procuring Contracting
Officer for GACIAC and CBIAC.

In addition to these individuals we also interviewed senior officials associated with each IAC's parent organization to further examine whether or not there were noteworthy differences among IACs operated under contract to for-profit, not-for-profit, or academic institutions.

We also conducted in-depth reviews of IAC products and procurement files at each IAC and at the Defense Electronics Supply Center. The focus of the document review centered on:

- Determination of benefits arising from each IAC's work;
- Methods used by each IAC to evaluate their own products and services to determine benefits.

IDA staff also interviewed Special Studies task monitor or other key staff at DoD facilities familiar with each special study conducted on behalf of those activities. In several instances, the special task monitor had left the DoD activity before the IAC special task had been completed, or had left subsequent to the completion of the task but before IDA had initiated the study of the DoD IAC Program. In such instances we were often able to locate knowledgeable individuals who were able to provide information on the benefits of the IAC special study to that DoD component. The results of these interviews bearing on IAC benefits to DoD components and their contractors are described in Chapters 5, 6, and 7. The results of interviews and the review of contract files are described separately.

IDA staff also contacted a number of FY 1987 and FY 1988 consumers of selected IAC core products and services to develop data bearing on the cost and benefits of such products and services.¹⁸ The users contacted had been recipients of either bibliographies prepared by IAC or consumers of technical inquiry services. We did not make a systematic

¹⁸ See below, Chapters 4, 5, and 6 for a detailed discussion of IAC user views on the benefits to DoD and DoD contractors derived from use of DoD IACs.

effort to contact recipients of IAC handbooks, data books, or newsletters because of the very large number of users in these categories and the rather vague purposes underlying their requests for such core IAC products. The results of these interviews are also recorded in Chapter 4, 5, and 6 and in a separate report dealing with IAC Program Administration, Management, and Oversight.

E. REPRESENTATIVE SAMPLE STUDY EMPHASIS

At the outset of the task and as documented in the work plan, the purpose of the representative sample study was to further develop and to apply a methodology to assess the effectiveness of the DoD Information Analysis Center Program in supporting the DoD Research and Development program. At the conclusion of an initial draft of the pilot IAC study, OSD asked IDA to continue to collect and to present information in the representative sample phase of the project in a format suitable for use in Congressional testimony and other discussions with senior Congressional staff and DoD managers regarding the IAC program.

During the course of the pilot study, the IDA study team was able to collect a great deal of information regarding the administration and management of the NTIAC contract. The quantity and quality of information collected during the pilot study exceeded initial expectations with respect to issues of IAC contract administration and management. As a result of discussion with R&AT staff following the briefing to Dr. Millburn, it was agreed that IDA would accelerate its efforts to include appropriate comments, alternatives, and evaluations of alternatives to improve the effectiveness and efficiency of the operation of the DoD IAC program. The information developed during the representative sample study regarding IAC program administration, management, and oversight is reported separately.

F. SUMMARY

During this phase of the IDA evaluation of the DoD Information Analysis Centers Program, IDA applied a methodology developed in the pilot study to evaluate the contribution of the DoD Information Analysis Center program to selected DoD research activities. In addition, the study of a representative sample of DoD IACs collected data about IAC contributions to the DoD research and engineering program that would support near-term discussions of IAC program budgets and other resource requirements. As a result of discussions with the sponsor and other participants in the IAC program, the inclusion of IAC program administration and management issues, alternatives, and

recommendations was accelerated from the last phase of the IDA study to the representative sample phase of DoD IAC program evaluation. The balance of this document is devoted to a discussion of the results of IDA's review of the products and services offered by four DoD Information Analysis Centers.

4. BENEFITS FROM CBIAC

A. INTRODUCTION

The Chemical Warfare/Biological Defense Information Analysis Center was chartered in 1986 to provide to the DoD community authoritative information on chemical warfare and biological defense science and technology. CBIAC has developed in a relatively short period of time extensive bibliographic data bases, portions of which are available to registered users of the Defense Technical Information System through the Defense Research On-Line Systems (DROLS). CBIAC is also in the process of developing and implementing major chemical properties data bases incorporating in easily accessible formats information on potential chemical warfare agents, antidotes, and decontaminating solutions dating back to the interwar period.

As one of the newest members of the DoD constellation of IACs, this IAC has had funding problems for its core program. Although promised \$500,000 in its contract with the Defense Logistics Agency for its core program, DLA has been unable to provide a full allotment of core funds since CBIAC's inception. Accordingly, CBIAC has focused its core program efforts on collecting chemical warfare and biological defense information, answering technical and bibliographic inquiries, and publishing a newsletter. The preparation of handbooks, state-of-the-art reports, critical reviews and other written products has been deferred or has been undertaken as special studies and tasks funded directly by DoD components and subsequently utilized as part of the CBIAC core program.

Funding for CBIAC for the period FY 1986 through FY 1989 is summarized in Table 4-1. This chart is helpful in scaling the size and magnitude of CBIAC's core programs supported by DLA and additional service funds as compared to its special task efforts. CBIAC is substantially smaller than most FFRDCs supported by the Department of Defense.¹⁹

¹⁹ See GAO Report on SDI Institute for further discussion of DoD FFRDCs.

Table 4-1. CBIAC Funding FY 1986-FY89

Fiscal Year	DLA Core Funding	Additional Funding by Services*	Special Tasks	Product Sales**	TOTAL
1986	0	\$125,000	0	0	\$125,000
1987	\$100,000	\$250,000	\$4,821,757	0	\$5,171,757
1988	\$162,000	\$237,316	\$3,736,538	0	\$4,135,854
1989	\$375,000	0	\$3,322,885	0	\$3,697,885

* Includes funds paid by the services for additional core services as well as "block funding" for IAC special tasks.

** Includes conference registration fees, serial and book sales, subscriptions to information services, and other information products as specified by each IAC.

The core CBIAC program employs two full time professional analysts, the IAC Director, and two additional information specialists who also perform some clerical duties. Special tasks performed by CBIAC consume substantial portions of Battelle Memorial Institute staff time.

B. CORE PROGRAM DESCRIPTION

The CBIAC core program consists of several services. Users may call, write, fax, or walk in to CBIAC to obtain information services and support. CBIAC operates a small collection of information at its facility at the Edgewood Area of Aberdeen Proving Grounds, MD. It has computer links to the central computer at DTIC where a portion of the CBIAC abstract and bibliographic information files are stored. CBIAC also has unclassified computer links to the Battelle Memorial Institute headquarters in Columbus, OH. Utilizing information available from its local files at Aberdeen Proving Grounds, the larger collection of information at Battelle Headquarters, and access to government and commercial data bases, the CBIAC staff can provide a broad range of information services to qualified users including bibliographic assistance, referrals to additional sources of information, and answers to technical inquiries.

The kind of information products provided by CBIAC staff can be divided into two broad categories: general distribution information products and individual response items. General distribution products are information items, documents, current awareness materials, or other information products that are prepared for distribution to all known or potential CBIAC customers. While they may respond to a specific problem or inquiry, such items are generally prepared with a single customer firmly in the mind of the IAC

Director, the COTR, or the user community at the time the product was conceived. CBIAC also prepares individual response items under the core program. These information products are prepared specifically in response to a request by one or more identified users. Bibliographies, referrals to specific sources of information in response to specific requests, and answers to technical questions in response to specific individuals are examples of this latter category of information product.

The only general information product distributed during FY 1987 and FY 1988 was the CBIAC Newsletter. This document range from four to eight pages in length was generally well received by the chemical warfare community.

CBIAC has handled a moderately large number of individual response information items since its inception. During the period calendar year 1988, CBIAC handled more than 300 such items. Table 4-2 summarizes significant individual response core information products or services during calendar year 1988 by military department, DoD component, or contractor.

Table 4-2. CBIAC Core Individual Response Users, Calendar Year 1988
Classification by Organization Type

Department of Defense	
Air Force	20
Army	88
Marine Corps	1
Navy	20
OSD	3
Other DoD	5
Other U.S. Government Agencies	11
Department of Defense Contractors	168
Battelle	55
Other Contractors	113
Academic/Professional Societies	2
Foreign Governments	5
NATO	3
Others	2
CBIAC Core Individual Response Population	323

CBIAC has been utilized by all military services and many DoD components during the period examined.

C. BENEFITS FROM THE CORE PROGRAM

1. Benefits of General Distribution Products

In the case of CBIAC, IDA did not systematically evaluate general distribution products because of the very limited number of such items produced by CBIAC. At the time IDA conducted its review of CBIAC core program products and services, it had produced only three quarterly newsletters with a fourth held up in the publishing process due to a lack of funds. Publication of planned handbooks, state-of-the-art reports, and critical reviews had also been deferred because of a lack of core funds.

We did review the reader survey included in the CBIAC newsletter. CBIAC routinely conducts surveys of its user community through the CBIAC Newsletter to obtain feedback on its products and services. We found upon a review of CBIAC's files very few questionnaires included in the newsletter had been returned. Most indicated that the CBIAC Newsletter was helpful, especially in identifying contracts recently awarded and upcoming conferences or meetings. However, no CBIAC Newsletter questionnaire respondent indicated that the CBIAC Newsletter was his or her principal source of information regarding the current state of affairs within the community. Several respondents suggested that a technical article might be valuable. However, the CBIAC Director and CBIAC COTR indicated that publishing such an article might be difficult given the information security and export control requirements under which the CBIAC Newsletter was published.

We believe on the basis of conversations with individual CBIAC users that it is likely that users of the CBIAC Newsletter who were not especially satisfied with it simply failed to return questionnaires; others who were satisfied may simply have been too busy to tell CBIAC about their use of CBIAC supplied information.

2. Benefits of Individual Response Services

In order to better understand how CBIAC users benefit from products and services provided by the IAC under its core program, we sought out a sample of individual response services for each IAC to be interviewed by telephone. The sample was generated by reviewing lists of CBIAC technical inquiries, bibliographic inquiries, and referrals. Telephone calls were placed to as many named individuals as could be located. CBIAC provided us with a listing of 323 users of core services in calendar year 1988. Of this

number, we spoke to 75 users. Of the 75, 14 were able to quantify benefits to their organizations either in terms of time or money. Table 4-3 summarizes our efforts to contact CBIAC individual response core program users.

**Table 4-3. CBIAC Core Users Survey--Individual Response Services Users
FY 1986-1988**

User Agency	
25	DoD Users
48	DoD Contractors
2	Commercial Ventures
Nature of Task	
23	Annotated/Critical Bibliographies
9	Documents
7	General Information
39	Technical Inquiries
6	Referrals
Funding	
Funded through Core Funds (\$262,000)	
Amount of Quantified Benefit	
8	Core Funded Tasks With User-Quantified Benefits Exceeding \$565,000
Methods Used to Quantify Benefits by Users	
Benefits of 5 tasks quantified on the basis of	
(a) time or effort saved or	
(b) costs of alternate source	
Benefits of 3 tasks quantified on basis of savings resulting from not having to conduct tests or by making engineering change plans	

The discussion that follows is an overview of more detailed descriptions of each interview found in Appendix D to this report.

(a) Quantitative Benefits

One user described his savings as thousands of dollars and a lot of time based on CBIAC provided information about setting up a data base. He explained that if he had to do it himself, it would have cost him more in time and money. In addition to increased ADP costs, there would also be a time lag in procuring the equipment.

Another customer provided two sets of figures as to how much money he saved by going to CBIAC. Appendix F lists the lower of the two figures. He used the information provided to pursue a study of threat agents; the bibliography and materials/agent property data that CBIAC provided as a free core service was used to narrow the avenues he needed to pursue. He estimated that had he gone out on contract, it would have cost him at least

\$8,000-\$10,000. If he had done the work himself, it would have taken 3-4 weeks to complete at a cost of \$6,000-7,000.

One manufacturer of optical displays for the 812 aircraft estimated that his company saved about \$2,000 by not having to test its equipment based on information provided by CBIAC. Avoiding the requirement for testing also saved his firm considerable time.

Another manufacturer had asked CBIAC for the effects of decontaminants on materials in collective and personal protective systems. Because of the information CBIAC provide, the manufacturer estimated a savings in the range of \$20,000-\$100,000 in comparison to the costs of conducting such tests on its own. This judgment was based on an estimate of 400 to 2000 labor hours of testing at a burdened cost of \$50.00 per hour required to obtain similar information.

One government employee had been tasked to develop an evaluation technique for collective protection units against biological agents. Had CBIAC not been available and a competitive contract for research support been required, he estimated that it would have taken nine months for him to receive any useable data and would have cost at least \$20,000 plus the costs of government personnel involved in the procurement action.

In two cases considerable savings occurred by not having to run tests. One individual estimated the value of information supplied by CBIAC in lieu of running a test to be \$40,000. Another individual, who asked for materials and agent property data as well, estimated CBIAC information on the chemical resistivity of certain polymeric materials saved his company about 2 years and about \$250,000 that would have otherwise been invested to obtain this information in its own research program.

Another user reported a dollar savings of \$250,000. The Army had proposed an engineering change plan (ECP) to modify gun sights. Based on information that CBIAC provided, he and his company were able to convince the Army that it was unnecessary to coat the interior of gun sights. By not having to perform the extra work, the government was able to save money.

One user described a \$2,000 savings to his company based on a bibliography provided by CBIAC. When a solicitation for a series of collapsible tanks requiring conformance with the chemical/biological warfare materiel survivability requirement was published, the user asked CBIAC if the tank coating of urethane used in his firm's existing products would be responsive to the solicitation. CBIAC reported that its analysis of available information on urethane strongly suggested that it would not be an effective

coating in a chemical warfare environment. Based on this information provided by CBIAC, his company did three things. First, it chose not to bid on the solicitation since the products offered would not be fully responsive to the solicitation. As a result, they saved scarce B&P money. Second, the company became fully aware of the chemical/biological materiel survivability requirement, of which it had been previously ignorant. This raised a serious concern within the company about the long term competitiveness of its products. Finally, the user did not simply retain the information for future reference or toss it aside once the company had made the "no bid" decision. He forwarded a copy of the information to the DoD agency soliciting the procurement, so that the requiring agency might better evaluate the responsiveness of other firms presenting offers. The CBIAC user told us he hoped that, at the very least, the information provided by CBIAC to him and then to the government would allow the contracting officer to make a more informed decision when he did award a contract.

Other users reported quantifiable benefits based on time and (one case) travel savings. Time savings ranged anywhere from 3 days to 1-1/2 years. In addition, time savings were almost always tied to a qualitative benefit.

At the low end of the time scale, one user got a bibliography from CBIAC which he used for background information. He could have found the information himself, but believed that it would have taken him from 3-5 days to get it.

In another case, savings of time were especially notable. The CBIAC user asked for materials property data and was provided the necessary information within a day as opposed to the week he estimated it would have taken if he had been required to find the data himself from the library. Furthermore, the user figured the cost of doing the work for himself to be \$1800 for 40 hours' worth of work.

A government user reported that on the basis of the technical information and referrals CBIAC provided to him, he was able to save about a week's time by not having to find either the information for himself or by having to chase randomly after contacts. He reported other qualitative advantages of CBIAC, which will also be discussed below.

One customer used CBIAC for assistance in acquiring information related to the development of CW related software and data bases. He estimated that if he had to go elsewhere, it would take 2-3 times longer to get information for a quick look study. Further, if he had to do the search himself, it would take about a month. However, he

would not do the search himself since it would be both impractical and inconvenient for him to do so.

Finally, one individual asked for an analysis of Freon for use in decontamination of LANTIRN pods. He estimated if his activity had been required to solicit a separate contract for the necessary information, it would have taken 12-18 months to obtain equivalent information provided by CBIAC in a matter of a few days. This user also cited a significant, but unquantified benefit from the CBIAC information. Freon used as a chemical agent decontamination solution can be detrimental to the LANTIRN pods.

Twenty-one CBIAC users reported unquantified (but quantifiable) savings in time, money, and also in opportunities. Of this number, 5 reported savings in both time and money, 6 reported money savings, 6 reported time savings, and 4 others reported savings either by value engineering plan changes, not performing an unnecessary test (2), or recovering lost work which the government had contracted but had never received in final form. These are discussed in some detail in Appendix F. However, the last case merits additional attention.

The user's firm is involved in the manufacture of remote sensing devices. She had heard that sometime in the early 1980s the government had sponsored work on particulates in a chemical battlefield environment. This information was particularly relevant to work she was performing. Clearly, if she did not have to go out and regenerate the data, there would be a significant savings of time and money. Ideally, the data would be in digital form; but even if it were not, it was clearly better than nothing.

She reported that after tracking down and contacting ten prospective leads, none had any knowledge of the earlier work done for the U.S. government. She called CBIAC on the outside chance that the staff might be able to help her. She reported that the CBIAC staff reported vital information to her within a day including the name and phone number of the person to whom she needed to talk.

The CBIAC user reported that she subsequently learned that the scientist collecting the original data she was seeking had left the contractor shortly before the final contract deliverable (the data) was due. His COTR had left shortly thereafter, and no one had followed up on the program. As a result, the data had been functionally resident in a computer since 1982. However, it was, for all intents and purposes, work that the government had "lost".

The CBIAC user was able to make arrangements to obtain the data. The savings were thus two-fold. She did not have to generate already extant (but misplaced) data, and the government was able to recover work that had been performed but not delivered.

In summary, CBIAC's quantified and/or quantifiable benefits break into the following categories. In the quantified category, 10 reported saving money in time and effort and 4 reported savings by engineering change plans or by not having to perform tests. Of the quantifiable but no quantity given, 14 reported savings of time and/or money and 6 reported savings by not having to conduct unnecessary tasks or by recovering lost data. As mentioned earlier, many of these benefits are also tied to unquantifiable but defined benefits as well.

(b) Qualitative Benefits

In this phase of the study, Evaluation of DoD Information Analysis Centers Program, several general classes of qualitative benefits provided by IACs were identified. The benefits cited by users included the following classes:

- Verification of information;
- Objectivity and/or neutral competence;
- Enhanced productivity;
- The ability to work to standards (in some cases, the standards the IAC helped to produce);
- Enhanced communication;
- Greater competition; and
- Improved military capability.

In the case of CBIAC, core program information consumers reported benefits in almost all of these classes.

(i) Verification/Substantiation

Verification of information does not merely include an IAC's stating that the information is correct; it includes enhancing the confidence that the questioner has about his technique or solution. Verification includes substantiation of analysis.

Eleven CBIAC users reported that the IAC they had used had provided significant benefit by verifying or substantiating data obtained from other sources. In some cases, independent verification had a quantifiable benefit.

One CBIAC user was able to save his sponsor an estimated \$250,000 based on CBIAC-derived data. This user told us that his sponsor was concerned that the interior of a gunsight might have to be painted to provide protection against materiel contamination in a toxic environment. Data supplied by the gunsight manufacturer suggested that the gunsight was adequately sealed against toxic vapors and would not be contaminated if exposed to a toxic environment. On the basis of information provided by CBIAC, it was determined that the gunsight manufacturer's data was accurate and the gunsight interior would not have to be painted.

Generally, CBIAC users who claimed the benefit of verification of existing information told us that CBIAC-data helped them by supporting other analyses. These frequently were critical to decisions about the need to test systems, subsystems or materials for survivability in a toxic environment.

(ii) Absolute Objectivity

No CBIAC core users told us that absolute objectivity or neutral competence was a major benefit to them. This was a surprising finding in light of the great significance attached to the objectivity of CBIAC information attached by special task users described below.

(iii) Enhanced Productivity

CBIAC also provided several customers with general information about chemical/biological warfare materiel survivability requirements which were credited with improving productivity by its recipients. In one case, a CBIAC user transitioned from the nuclear survivability mission area into another field. Based on information provided by CBIAC in a series of briefings, he felt he had learned the key elements of the chemical/biological materiel survivability requirements more quickly than if he had tried to sit through a series of Army and contractor presentations.

Finally, as noted above, one user reported that CBIAC made him aware of a potentially serious problem associated with decontamination of LANTIRN pods. Although the results of the CBIAC study indicating Freon might be potentially damaging to the system if used as a decontaminant, the CBIAC user told us that no changes would be made in the program. It was too far into production, at this time. Making changes to correct the materiel vulnerability problem identified as a result of the CBIAC analysis would be

prohibitively expensive. However, it is beneficial to be aware of the potential problem so that future programs like it can work around it.

(iv) Standards and Standardization

Army Regulation 7071 "Research, Development, and Acquisition: Nuclear, Biological, and Chemical Contamination Survivability of Army Materiel," dated 1 April 1984, specifies general requirements for the design and operation of Army material in a toxic environment. It has been incorporated in an evolutionary manner in Army acquisitions since 1984. Many suppliers of equipment to the Army are only now becoming familiar with the requirements of this regulation. Our interviews found many manufacturers who are eagerly turning to CBIAC in order to obtain data and advice necessary to determine whether or not their products meet the requirements of this regulation.

One CBIAC user told us that CBIAC was the authoritative voice for the government in terms of chemical and biological warfare materiel survivability information. Other CBIAC users reported that they had experienced difficulty in obtaining information regarding AR 7071, up to and including obtaining a copy of the Army Regulation. These users were universal in their praise for CBIAC's assistance in identifying and even supplying on occasion copies of relevant directives, regulations, and instructions. Data and other information provided by CBIAC enabled our respondents to determine what tests if any were needed to determine whether or not the products offered could meet the requirements of AR 7071. It ensured that they would meet their contractual obligations.

(v) Enhanced Communication

The basic DoD directive covering the collection and dissemination of scientific and technical information, DoD Directive 3200.12, establishes a very ambitious program for the communication of such information between DoD components and their contractors. Many core IAC users with whom we spoke had high praise for the technical conferences and symposia sponsored CBIAC for identifying new developments or new sources of information that could assist them in their RDT&E efforts. While few users could attach dollars to the benefit of communicating more effectively with other members of the CBW community, many felt that there was a significant savings in time and dollars associated with use of CBIAC as a conference sponsor, convener, and reporter.

(vi) Enhanced Competitiveness

Enhanced competitiveness means an expanded DoD-related industrial base. The Competition in Contracting Act on the one hand and pressures on DoD to obtain more products and services with shrinking resources on the other have placed renewed emphasis on obtaining more "bang for the buck." Not only is DoD interested in expanding the DoD-related industrial base, the application of the Competition in Contracting Act to DoD contracts has encouraged DoD vendors to expand their product lines to remain competitive. DoD IACs have been helpful to the competitive processes in several instances as documented thus far in our study.

Two CBIAC users emphasized the role CBIAC played in allowing them to compete in the market place. One company is a consulting firm which tries to match U.S. and foreign firms interested in joint ventures to meet U.S. military equipment needs. This user went to CBIAC to find the names of people in the DoD and the government who could benefit from a client's protective clothing. The information provided by CBIAC enabled this user to undertake a more sophisticated analysis of the DoD market for his client's protective ensemble. He stated that small business cannot afford to do a lot of research. He saw IACs as having enormous potential for helping small and disadvantaged businesses simply because the IACs could provide them with the various kinds of information that they needed more rapidly and cheaply than they themselves could do.

Another small business stated that he used the information provided by CBIAC to develop a more effective marketing strategy. Data collected by CBIAC was used to identify a potential need; additional data was collected from CBIAC to support additional marketing and training efforts once a specific marketing objective had been identified. This CBIAC user estimated that CBIAC's assistance had significantly reduced the amount of time and energy he had to expend to identify and develop marketing opportunities in the chemical warfare mission area.

Two CBIAC respondents mentioned using the IAC as part of the bidding process. One entailed an enlightened "no bid" decision already noted above. The other involved looking at a competitor's product. In this case two manufacturers produced similar fabrics using different techniques. The interviewee's company had chosen not to bid on a proposal. However, its management was curious to know whether or not the winner of the contract had developed a new manufacturing process that would essentially render the CBIAC user's firm uncompetitive for the foreseeable future. On the basis of information

provided by CBIAC, it was determined that the rival firm was using a technique that had in fact been investigated by the CBIAC user in the past and had been found to be of limited utility in the manufacture of their product. Thus the CBIAC user's firm remains on the sidelines of the procurement of chemical defense cloth at this time, but is hopeful that it can compete effectively at some point in the future.

(vii) Improved Military Capability

Several CBIAC core users reported that the use of CBIAC had impacted directly on the military capabilities of U.S. forces. For example, one user relied on materials property data supplied by CBIAC to recommend a new material to be used in litters to transport casualties. The new material was more resistant to chemical agents and stood up better to decontamination agents should their use be required. Another core user, noted above, identified significant problems with LANTIRN pods. Decontamination efforts with current equipment will cause serious degradation of capability.

A core user involved in materials survivability studies used CBIAC information to assess the survivability of the laser range finder integrated into the Commander's Integrated Display. CBIAC data resulted in product improvements through the use of chemical agent resistant materials and better fabrication processes. Another user relied upon CBIAC information to address the issue of ATM effectiveness against chemical-agent missile warheads.

D. BENEFITS FROM SPECIAL TASKS

1. Background

In addition to building a collection of information in a specific discipline or mission area and disseminating information and analysis based on it for the entire relevant community, DoD IACs also undertake more focused tasks on behalf of individual government requiring activities. Special tasks are undertaken only after the Technical Monitor and the Procuring Contracting Officer evaluate technical proposals to determine if the proposed task is within the technical scope of the IACs contract and if the IAC has the necessary expertise to perform the task. It is the core funding which establishes and maintains the IAC's capability to provide products and services of value to the users.

The decision to use an IAC to perform a special task is, from the point of view of the Special Task requiring activity, a free market decision. As we were able to document in

this phase of our study, most IAC special task users have a variety of procurement instruments available, including full and open competition for research and development contracts, open task order contracts for mission support services, technical services, base support, etc. A decision to use a DoD IAC suggests that the requiring activity has determined, *ipso facto*, that IAC products and services are worth more than they cost. While that is a rather simplistic assumption, it does establish a different sort of lower bound for benefit valuation--benefits may be postulated as always equaling or exceeding costs.

In this analysis we sought the user's evaluation. Those evaluations took several forms, from the most conservative (how much would the same amount of effort cost in-house and what is the comparable quality) to the most extravagant (what was the total cost versus the total benefit of the experiment in which the IAC was participating).

All of these estimates are more or less objective: none is completely objective because, in every case, the actual cost must inevitably be compared to the cost of something not done--and insofar as it was not done, its estimated cost must be subjective.

Our methodology was quite simple and straightforward. We examined the list of special tasks provided by CBIAC to determine whether there were either individual heavy users of each IAC or geographic concentrations of heavy users. We found that we could cover most of the users with only a few trips. Utilizing a questionnaire to provide a framework for data collection, we conducted more than 30 interviews with special task users of CBIAC (see Table 4-4). The purpose of these interviews was to understand the process by which special task users selected CBIAC to perform a task, completed the procurement of the task, and evaluated the benefits of the work performed by an IAC for their program. It should be further noted that the interviews were not constrained in any manner by the questionnaire.

Table 4-4. Sample IAC Special Task Users by Military Service

Service	# of Tasks
Air Force	10
Army	28
Navy/Marines	11
OSD	1
Other USG	1
Total Population	51

We were able to collect data through interviews on 32 CBIAC tasks²⁰ undertaken during FY 1987 and FY 1988. Data was collected through hour-long interviews followed up from time to time by additional telephone conversations or correspondence. Table 4-5 captures the degree to which our study was able to cover the special tasks undertaken by each IAC.

Table 4-5. Coverage of Special Tasks by Representative Sample Study

	Air Force		Army		Navy	
	Tasks	Dollars	Tasks	Dollars	Tasks	Dollars
CBIAC	100%	100%	81%	83%	42%	59%

As this table indicates, our efforts to cover a broad sample of special task users of CBIAC was reasonably successful. As much success was achieved in large part because CBIAC is a young IAC and most of the initial special task users are still at the assignment at which they were serving when they placed their task order.

An issue arose during the pilot study regarding the kinds of funds being spent at DoD IACs. In the case of CBIAC, we were fairly fortunate in identifying the various kinds of RDT&E, O&M, and Procurement funds being expended to pay for special studies and tasks. The data follows in Table 4-6.

Table 4-6. Budget Categories* of Special Studies Performed by CBIAC

Budget Category	AF	CBIAC	
		AR	N
Unknown	3	10	4
6.1		4	
6.2		11	
6.3A	3	10	2
6.3B		1	2
6.4		4	
O&M			
Procurement			1

* This table treats each occurrence of a budget category as a discrete source of funds even though there are several instances in which funds from multiple budget categories are used to support one task.

²⁰ For purposes of simplifying travel planning and analysis of data, we have treated multiphase special tasks conducted for the same requiring activity as one task even though the IACs will report each phase as a separate task. As a result, we understate by a small margin the number of tasks actually reviewed for each IAC covered in this report in comparison with the number of tasks reported by the IAC Program Office at DTIC.

It is also worth noting that the CBIAC Director and the CBIAC Technical Monitor (COTR) are generally unaware of or uncertain about the category of funds being expended at CBIAC in the procurement of special studies. The CBIAC Director and CBIAC Technical Monitor believe their activities support the entire acquisition community, not merely the research and development phase of the acquisition process. As a result, we were able to identify the category of funds being used to procure a special task only by talking with the special task requiring activity.

2. Benefits Discussion: Overview

IDA was asked early in the course of this task to construct a benefit-cost ratio if at all feasible. The aggregate data presented in Table 4-7 below allows for the coarse calculation of such a benefit-cost ratio for CBIAC. If one assumes that the full cost of the special task was the cost paid by the requiring activity to CBIAC, then the data below suggest that CBIAC special tasks have a benefit-cost ratio in aggregate of approximately 3.5 to 1. This ratio is derived from dividing the quantified benefits of \$1.4 million from 5 special tasks by the \$431,000 cost of the tasks.

Table 4-7. Quantitative Benefits From Selected DOD IACs

IAC	# of Tasks with Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
CBIAC	32	\$4,268,000	\$1,407,500	LOWER LABOR RATES DEFERRED PROCUREMENT
	5	\$431,000		

We also found several IAC special task users who described the results of IAC special tasks in terms that lead us to believe at some future point in time it will be possible to quantify the benefits of the IAC work; it is not possible to do so at this time. Finally, we found several IAC users who told us of benefits that had been received from the work performed by an IAC which were important to their programs but could not now be quantified, nor was it ever likely that such benefits would be quantifiable.

Table 4-8 summarizes the results of our efforts to categorize the benefits reported by special task users of CBIAC in terms of quantified, quantifiable, defined and undefined benefits. As the table makes clear, most special task users with whom we spoke were able to define the benefits of IAC special tasks for their research and engineering programs; they were frequently able to define the benefits of special tasks in terms that might permit quantification of benefit in terms of dollars saved or hours saved at some future point in time. Several users reported benefits that might at some future point be reported in terms of improved performance of military personnel as measured by standard training techniques. However, unlike the pilot study of NTIAC, we report only one instance of quantifiable benefits obtained for each IAC included in this phase of our study.

Table 4-8. Benefit Categories Reported by Special Task Users of CBIAC*

Benefit Type	CBIAC
Not known	
Quantified	5
Quantifiable but no data available	16
Defined but not quantifiable	31
Not defined	1

* Benefit categories reported include multiple benefit categories per task where some tasks had benefits which could be quantified but had not been and also included benefits which could be defined but could not be quantified.

It should be noted further that several users reported benefits that were both quantifiable as well as defined but not quantified--e.g., future improvements military personnel performance in training (quantifiable) and enhancement of deterrence (not quantifiable).

The overall results of our investigation stand in marked contrast with the results of the pilot study in which we found a substantial number of cases in which special task users were able to quantify the benefits they received from using the services of NTIAC. On the other hand, the value of the benefits attributed to these four users who can report quantifiable benefits is more than sufficient to cover the costs of the entire IAC program, even when heavily discounted due to the uncertainties of partitioning variance in benefits among all those individuals and organizations outside the IAC that might have contributed to the creation of such benefits.

3. Quantitative Benefits Assessment

Table 4-9 summarizes all special tasks undertaken by CBIAC for which we were able to determine quantitative benefits. We were able to identify a total of 33 special tasks undertaken by CBIAC since the inception of its contract. We were able to obtain data regarding the benefits of 31 special tasks. Six tasks undertaken by CBIAC with a total contract cost of \$849,643 resulted in benefits which can be quantified at not less than \$1,407,500. One of these tasks had an upper bound of more than \$6 million suggested by the user; we believe CBIAC should be credited with a fraction of that amount. We were not able to devise a method to partition the value among the government personnel, other consultants, and the CBIAC effort.

In one special task CBIAC undertook an analysis of requirements for the operation of a network of laboratories which could pool data collected to support analysis and assessment of potential chemical agents. The benefits identified by CRDEC were valued at \$225,000. Another CRDEC task examining methods of collective protection for armored vehicles yielded a small benefit measured in terms of dollars but a very large benefit in terms of operational capability.

In another CBIAC task, an assessment of the effectiveness of an alternative concept for the operation of armored vehicles in low-level contaminated environments was undertaken. This task resulted in verification of a design, proof of concept, improved training, and a small quantified benefit to the government in excess of \$5,000 based on lower costs of CBIAC personnel compared to government personnel. It was emphasized by the special task user that from his perspective, the IDA study was essentially dividing the benefits of CBIAC by zero because although CBIAC staff were less costly than U.S. Government personnel, no government personnel were available to perform the work necessary to resolve the technical question of armor vehicle operation in a low-level chemical contaminated environment. If CBIAC did not exist, the study which had significant qualitative benefits would simply not have been performed.

The USDA office in Sacramento commissioned a \$20,000 task to complete work initiated by another contractor for about \$60,000 that was not adequate. The results of the CBIAC work were very satisfactory, and were deemed equivalent to the work undertaken by the other contractor. IDA valued the benefit of this task at \$60,000.

TABLE 4-9: Quantitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-02	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$150,000.00	Brooks, Mr. Marguerite (301) 671-2550	Prepare a report on proposed network of laboratories capable of performing chemical analysis on various substances, conduct reviews of proposals to network such laboratories.	Savings in time, improved R&D program, improved R&D performance, savings relative ARO documents which are useful laboratory procedure guides, neutral competence; improved communication within USG regarding chemical warfare and threat.	Estimate: \$225,000	Although no quantified benefit was reported, relative savings were calculated. ARO is about 1.5 times as expensive as is CBIAC for comparable work.
CB-23	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$22,800.00	Zachra, Mr. James (301) 671-2140	Systems concept evaluation and development of alternatives.	Improved operational capability, improved valuing concepts, improved production methods for collective protection in armored vehicles.	> \$28,500	1.25 : 1 on cost CBIAC to in-house; 1.25 to 1.5 : 1 on time to complete CBIAC to in-house; staff; no quantified estimate of quality, but CBIAC superior in quality to attempting literature analyses with own staff. Cost comparisons do not include eqd
CB-27	US Forest Service, Forest Pest Management, 2121C Second Street #102, Davis, CA 95616	\$18,000.00	Berry, Mr. John W. (916) 758-4800	Revise midrange model of forest canopy penetration of vapors to run on microcomputer; merge two different spray models.	Model of spray dispersion to analyze a broad range of problems; USDA got a Forest Penetration Model that could be loaded into a laptop for use in field evaluations of herbicide and pest control efforts; DoD got an improved vulnerability/ME calculations.	> \$54,000	Cost of equal work provided by two different contractors, 3 or 4 to 1 in terms of cost; other contractors unable to perform adequately on this task.
CB-32	US Air Force, HSOYAK, Brooks Air Force Base, TX 78235	\$108,947.00	Steen, Lt. (612) 838-2848	Evaluate methods used by AF to size and train personnel in use of gas mask.	halted procurement of gas mask in instrumentation tools; changed procedures for testing, certifying mask and users for combat; validated conceptual approach of using hardware to measure correctness of mask fit; discarded proposed piece of equipment.	> \$1,000,000	Precluded several million dollar contract that would have been wasted; will allow AF to get the right piece of equipment earlier; improvements in readiness, capability.
CB-60	US Army Program Manager, Chemical Munitions, Aberdeen Proving Ground, MD 21010	\$80,000.00	Brackowitz, Mr. (301) 671-4103	Need information support for the Chemical Demilitarization Branch; focus on environmental safety; industrial processes; explosive ordinance disposal; organic files and facilitate port, and public access to information.	Superior performance of a library at lower cost than previous contractor; improved access to demilitarization, delamination, disposal information for contractors and DoD personnel.	> \$ 100,000	Evaluation of alternative contractor, 1.25 to 1 on labor cost basis; no quantitative value attached to having a working library.

The Air Force asked CBIAC to undertake a study which would be used to qualify a device proposed to measure the adequacy of fit of gas masks for Air Force personnel. The objective of the program was to use the device to reduce uncertainty of fit resulting from human measurement of gas mask fit. The CBIAC study demonstrated that the device was not capable of adequately measuring gas mask fit. As a result, the Air Force deferred procurement indefinitely, saving at least a million dollars for an indefinite period. Furthermore, the Air Force also learned that the training program for donning and use of gas masks was highly ineffective. This caused a change to be made in gas mask training as well.

CRDEC established a library to support the Chemical Demilitarization Program Office (CHEM DEMIL) office. CBIAC operated a very specific information center/service based on its expertise in the field and in the ability to collect and manage specialized information. CBIAC took over from another contractor. The special task monitor estimated that CBIAC staff had made 3 times the amount of information available to users of the special library as the previous contractor for about two-thirds the cost. IDA estimates that the dollar value of the benefit to CRDEC resulting from this task is \$100,000.

4. Qualitative Benefits Assessment

As in the case of the pilot study of NTIAC, we found many special task users of CBIAC unable or only partially able to quantify the benefits they received from using a DoD IAC. On the other hand, these users were able to describe other contributions of the work performed by IACs included in our study which are of special significance to DoD, even if the benefits cannot be quantified in a direct or meaningful way. Table 4-10 summarizes the description of the qualitative benefits accruing to special task users of CBIAC. In several instances, tasks previously described as having quantifiable benefits also had qualitative benefits of note.

The following is a more detailed discussion of some of the special task qualitative benefits reported by CBIAC users.

(a) Improved Military Capability

CBIAC special task users also reported direct impact on combat capability and readiness as a result of CBIAC studies. Several Air Force users identified CBIAC studies

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-01	Air Force Aeronautical Systems Division, ASD/ASED Wright Patterson AFB, OH 45433	\$145,991.00	Minnich, Mr. William (513) 255-2478	Support for the 1987 Air Force Conference on Maintenance of Air Base Operations in a Chemical Biological Warfare Environment.	Improved knowledge and understanding of air base operations; savings in time and effort for Air Staff and contractors involved in air base operations.	Not quantified	
CB-02	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$150,000.00	Brooks, Mr. Marguerite (301) 671-2560	Prepare a report on proposed network of laboratories capable of performing chemical analysis on various substances; conduct reviews of proposals to network such laboratories.	Savings in time, improved R&D program; improved R&D performance; savings relative ARO documents which are useful laboratory procedure guides; neutral competence; improved communication within USG regarding chemical warfare and threat.	Estimate: \$225,000	Although no quantified benefit was reported, relative savings were calculated. ARO is about 1.5 times as expensive as is CBIAC for comparable work.
CB-03	U.S. Navy, Naval Sea Systems Command, Washington, DC 20376	\$317,378.00	Pattin, Dr. Gloria, (202) 269-2980	Build data base of Navy CBR programs, assess areas of overlap; assess areas where need for analysis was not being met.	Improved planning and analysis capabilities; potential for improvements in Naval operations; neutral view of requirements, capabilities very helpful, especially in evaluating foreign equipment test results.	None quantified	
CB-05	Air Force Aeronautical Systems Division, ASD/ASED Wright Patterson AFB, OH 45433	\$224,997.00	Minnich, Mr. William (513) 255-2478	Evaluate friendly foreign CBR equipment; assess strengths and weaknesses of foreign equipment.	Combat capability enhancements as a result of foreign equipment evaluation; shortened R&D cycle; lessons learned from foreign equipment.	None quantified	
CB-06	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$7,000.00	Belcastro, Mr. Frank (301) 671-3420	Provide materials, documents, displays, editorial services and literature on CW survivability.	Publicity for new Army requirement; acceleration of incorporation of NBC survivability concerns into design and engineering of Army equipment; lower life cycle costs including redesign to take into account NBC survivability issues.	None quantified	

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-08	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$18,474.00	Blewett, Mr. William (301) 671-3822	Develop concept of operation for a tank maneuvering in contaminated area with tank commander standing in the open hatch -- keep toxic vapors out of tank hull.	Potential solution to operational problem; will lead to improved operational capability.	None quantified	
CB-10	US Air Force Wright Aeronautical Laboratories, AFWAL/ASD, Wright Patterson AFB, OH 45433	\$288,988.00	Meyer, Mr. Fred (513) 255-5708	Build and maintain microcomputer data base of chemical defense information.	Making available to Air Force Researchers and technicians latest available information on chemical defense, decontamination solutions, and decontamination techniques.	None quantified.	None quantified but significant potential for savings in time and materials costs.
CB-11	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$80,000.00	Browning, Mr. Bryan (301) 671-4411	Review building plans to verify that pilot production facility was designed to be environmentally safe.	Construction program was politically sensitive; independent technical advice on safety, environmental issues from qualified source; higher public confidence in building design especially sensitive in area due to indictment of former Army officials.	Not quantified.	Dollars saved because changes recommended were done so early in the design process
CB-12	US Air Force, HSD/YAZ, Brooks AFB, TX 78235	\$439,808.00	Smoger, Lt. Col. Tom (512) 538-2274	Synthesize the delineation of CW threat facing USAF in Europe; describe implications of threat for USAF casualties; Synthesize and evaluate document/model casualty workflow for medical staff planning developed by BDM and Jaycor	Sequence of CBIAC work was critically important to overall USAF program. Developing model at front end allows for more discriminating collection of data, analysis of data, and development of acquisition and logistics requirements.	None quantified.	High value attached to verification of work performed by other contractors
CB-13	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$49,828.00	Himmelsheer, Mr. Thomas (301) 671-3850	Build and sustain data base on chemical warfare studies and analyses; capture history, data, and policy studies.	Ability to capture data from old experiments without raising issues of treaty compliance of considerable diplomatic and policy value; cost avoidance of repeating experiments also significant.	None quantified.	High value attached to preserving scientific record of work which can no longer be pursued in light of current treaty obligations

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-15	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$30,000.00	Bot, Mr. Dennis (301) 671-3570	Detector sensitivity analysis--what happens to ability of detector to work depending on the location of a network of detectors around a facility.	Significant savings in time. A generic agent detection system was deployed to protect forward deployed installations; CBIAC facilitated use of Air Force and Army components and integrated a Li service activity and hardware design into a test system.	None quantified	
CB-16	US Air Force HSD/YAX, Brooks Air Force Base, TX 78235	\$200,000.00	Maj. Cathcart and Lt. Baker (512) 536-2842	Synthesize and analyze data on ground crew work performance in chemical protective gear.	Change in Air Force doctrine/training/readiness activities to require periods of cooling off in air conditioned areas to relieve heat stress; development of requirement for micro-miniaturized cooling systems for prolonged periods of work in MOP.	None quantified yet	Should be measurable in terms of improved performance in the future. Baseline measurements suspect
CB-17	US Army, Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD 21010	\$25,000.00	Vozella, Mr. Joe (301) 671-2338	Facilities support--upgrading of facility and preparation of documentation relating to litigation against the government. Also had some work done in Smoke Division for a smoke/obscurant master plan.	Edgewood/Aberdeen produced building design which could stand up to legal and Congressional scrutiny; met court-imposed time tables which could not otherwise have been met. CBIAC comments on Smoke/Obscurant Master Plan review improved program.	None quantified	
CB-18	Air Force Aeronautical Systems Division, ASD/PSED Wright Patterson AFB, OH 45433	\$350,000.00	Mende, Mr. William (513) 255-2479	Evaluation of foreign (NATO) CB equipment to consider for incorporation into US inventory.	Savings in research and development costs when NATO equipment is shown to be an acceptable alternative.	Not yet quantified.	Program is just getting underway. No data yet.
CB-19	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010		Casale, Mr. Frank (301) 671-4433	Three tasks: background study on procedures for laboratory and environmental safety and surety; develop system for tracking chemicals within laboratory environment; continuing education by producing a course on laboratory safety.	Improved laboratory safety; preempted critical IG inspection; improvements in overall technology base; credibility to outside groups that DoD is listening and paying attention to competent outsiders.	None quantified	

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-23	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$22,800.00	Zachis, Mr. James (301) 671-2140	Systems concept evaluation and development of alternatives.	Improved operational capability; improved training concepts; improved production methods for collective protection in armored vehicles.	> \$28,500	1:25 : 1 on cost CBIAC to in-house; 1:25 to 1.5 : 1 on time to complete CBIAC to in-house; staff; no quantified estimate of quality, but CBIAC superior in quality to anticipating literature analyses with own staff. Cost comparisons do not include equi
CB-25	US Navy, Naval Personnel R&D Center, San Diego, CA 92152	\$11,200.00	Robinson, Dr. Carol (818) 553-9271	Collect literature and prepare annotated bibliography on CW effects on naval personnel ability to perform tasks in AOP; help to develop tools to evaluate training.	Now known what has to be done, how training needs to be changed; effects of training can now be evaluated.	Not yet quantified.	None data yet but eventually data should show up in Operations Evaluation; performance review pre and post training
CB-26	US Army, Army Medical Research and Development Command ATTN: SGRD-JA, Fort Detrick, MD 21701	\$378,808.00	Raney, Lt. Col. (301) 683-2068	Conduct survey of genetic environmental impacts of US Army Biological Defense Program; map out strategy for preparing maximum and minimum EIS for the BW Defense Program; advise on data requirements, data collection strategies.	DoD understands full range of environmental impact issues over which it may be subject to litigation; has a method to allocate scarce personnel and fiscal resources to reduce the likelihood of crippling litigation; EIS issues are litigated.	No direct quantified benefits; alternative costs of program halted estimated at \$0.5 million	Avoided injunction by providing substantive data on need to proceed with program - Saved time: Did work for which in house staff not prepared to do. CBMRDC would still
CB-27	US Forest Service, Forest Pest Management, 2121C Second Street #102, Davis, CA 95618	\$18,000.00	Berry, Mr. John W. (916) 758-4800	Revise maintenance model of forest canopy penetration of vapors to run on microcomputer; merge two different spray models.	Model of spray dispersion to analyze a broad range of problems; USDA got a Forest Penetration Model that could be loaded into a laptop for use in field evaluations of herbicide and pest control efforts; DoD got an improved vulnerability/ME calculations.	> \$54,000	Cost of equal work provided by two different contractors. 3 or 4 to 1 in terms of cost; other contractors unable to perform adequately on this task.
CB-30	US Army Biomedical Research and Development Laboratories, Bldg 568 Room 108, Fort Detrick, MD 21701	\$82,548.00	Vanderchalla, Dr. William (301) 683-2027	Develop process to use biological methods to detect the presence of toxic chemicals in the environment - capitalize on special sensitivity of organisms to chemicals.	Provided low cost, sensitive, effective systems to detect toxic substances in raw drinking water at fixed installations; or to check toxic spills such as occurred in the Ohio River for toxic spills entering environment.	Not quantifiable.	Medical treatment avoided, lives saved.

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-37	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$50,000.00	Wentzel, Dr. Randal	Examine Technologies to remove particles and aerosols from soil surfaces; clean up after smoke, chemical agent simulants.	Significant impact on environmental impact statements related to tests, exercises using smoke and CW simulants; avoided delay in open air testing of smoke equipment; improved training; improved combat readiness.	None quantified	
CB-41	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$181,000.00	Leach, Mr. Ernie (301) 671-2108	Analysis of reliability of ASICs and Hybrid microcircuits for use in CW detector circuit boards.	Prototype detector system where none existed before; study developed test procedures, trained Army personnel to do QC/QA work; accelerated system acquisition.	None quantified	Comparison of in-house costs: Savings of \$5-10K in training (10% less than gov't); 50% faster than if gov't did work; labor costs 1.1 to 1; time costs 2 to 1; quality not quantified but very substantial.
CB-48	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$22,000.00	Belcastro, Mr. Frank (301) 671-3420	Complete aviation NBC compendium begun by Aviation Systems Command.	Engineers are getting design sensitive information while designs are still in draft and can be easily changed.	None quantified yet but effects should be measurable	Number of redesigns required to meet NBC criteria.
CB-50	U.S. Navy, Naval Sea Systems Command, Washington, DC 20376	\$25,000.00	Petion, Dr. Gloria (202) 268-2880	Conduct an assessment of battle damage aboard ship and possible alternative design concepts to minimize problems.	Explored at low cost an alternative model for assessment of chemical vulnerability of ships; verified credibility of existing analytical tools.		
CB-52	US Air Force, HSD/VAX, Brooks Air Force Base, TX 78235	\$199,947.00	Sterle, Li. (512) 536-2842	Evaluate methods used by AF to size and train personnel in use of gas mask.	Hated procurement of gas mask in instrumentation tools; changed procedures for testing, certifying mask and users for combat; validated conceptual approach of using hardware to measure correctness of mask fit; discarded proposed piece of equipment.	> \$1,000,000	Precluded several million dollar contract that would have been wasted; will allow AF to get the right piece of equipment earlier; improvements in readiness, capability.

TABLE 4-10: Qualitative Benefits of Selected CBIAC Special Tasks

TASK ID	USER AGENCY	FUNDING	CONTACT	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
CB-56	US Army Chemical Research and Development Engineering Center, Edgewood Area, Aberdeen Proving Ground, Maryland 21010	\$20,000.00	Brooks, Ms Masquitta (301) 671-2560	Review recommendations of earlier panel on laboratory procedures; make recommendations on procedures and instrumentation need to improve Army's ability to analyze prospective agents.	Improved analytical procedures; improved analytical capabilities; better estimation of threat and more realistic chemical defense requirements; improved ability of USG to undertake defense of its actions in court when confronted with EIS litigation.	None quantified	
CB-60	US Army, Program Manager, Chemical Munitions, Aberdeen Proving Ground, MD 21010	\$80,000.00	Blankowitz, Mr. (301) 671-4103	Need information support for the Chemical Demilitarization Branch; focus on environmental safety; industrial processes; explosive ordnance disposal; organize files and facilitate govt. and public access to information.	Superior performance of a library at lower cost than previous contractor; improved access to demilitarization, detoxification, disposal information for contractors and DoD personnel.	> \$ 100,000	Evaluation of alternative contractor, 1.25 to 1 on labor cost basis; no quantitative value attached to having a working library.
CB-62	US Air Force, Armament Directorate/YOO, Eglin AFB, FL 32542	\$75,000.00	Kasada, Maj. (804) 882-4885	Perform case study of Misawa Air Base to develop method for assessing vulnerability of Air Bases to chemical attack.	Air Force now has a standardized method for assessing generic Air Base vulnerability to chemical warfare; has resulted in production of a "Chemical Guide For Commanders" -- readiness and operational capability.	Not yet quantified	Quantifiable but no quantified benefits yet reported; could be measured by changes in readiness attributed to improvements in CW preparedness at air bases using CBIAC's Chemical Guide for Commanders; too soon to measure
CB-66	U.S. Navy, Naval Sea Systems Command, Washington, DC 20378	\$425,000.00	Pattin, Dr. Gloria, (202) 285-2980	Collect and analyze data relating to Naval CBR programs.	Improved planning and analysis capabilities; potential for improvements in Naval operations.	None quantified	
CB-68	US Navy, Naval Personnel R&D Center, San Diego, CA 92162	\$10,000.00	Robinson, Dr. Carol (619) 553-9271	Collect data needed to evaluate Navy CBR training effectiveness; design training evaluation model.	Analytical tools for the Navy which can be quantified and used to evaluate the effectiveness of training for continuing operations in a toxic/contaminated environment. Ultimately, benefits can be quantified.	None quantified	

on air base operability and a detailed case study of one very important air base as contributing significantly to changes in the Air Force doctrine of wartime air base operations. Other CBIAC studies have resulted in development and acquisition of improved agent detectors, improved agent detector data integration and analysis, improved tank hatch covers for operations in low level contamination, and successful evaluation of foreign chemical defense material for potential incorporation into U.S. forces.

Other CBIAC studies have resulted in major changes to the manner in which Navy and Air Force personnel are trained to operate in toxic environments. One CBIAC study also resulted in the deferral of an acquisition of a piece of equipment to test gas mask fit on Air Force personnel. The study demonstrated that the piece of equipment was not capable of satisfying the requirement; furthermore, the study demonstrated to the Air Force that its training on the use of gas masks was ineffective.

(b) Objectivity and Neutral Competence

In our pilot study, we noted that sometimes it was as important to get an answer from an organization acknowledged to be a disinterested expert as it was to get an answer. Our representative sample study found several examples of this benefit as well.

The existence of CBIAC has played an especially prominent role in its selection for several special tasks. In one case, the Army and a civil plaintiff were able to reach an out-of-court settlement over the adequacy of the Army's compliance with the National Environmental Protection Act based on a CBIAC analysis of environmental impact requirements for the Army's Biological Defense Program. In other instances, CBIAC has undertaken an independent review and evaluation of architect and engineer drawings and plans for new facilities at the Edgewood Area of Aberdeen Proving Ground. The purpose of the review was to advise the Chemical Research, Development, and Engineering Command on the adequacy of industrial hygiene and environmental protection in the proposed facilities. CBIAC was selected to provide such advice because it was perceived as having both the capability on the one hand, and the independence and stature on the other, needed to fend off complaints or Congressional concerns about the adequacy of environmental and industrial hygiene reviews conducted solely within the Army.

(c) Enhanced Productivity

One CBIAC user has gained such confidence in the quality of CBIAC's work that he no longer undertakes or permits members of his staff to undertake any study without

first consulting CBIAC. This user told us that he had been able to save hundreds of man-hours that would have been devoted to merely identifying the existing record; furthermore, CBIAC staff were able to point him and his colleagues in more useful directions. The gain in productivity occurred not only because of hours saved but in terms of better questions being asked, more sophisticated analyses of existing data, and more focused collection of new data.

CBIAC, too, has played a major role in improving test methodology, protocols, and operating procedures for the Army and the Navy. Several CRDEC staff identified improvements in test methods as the most significant benefit of the use of CBIAC.

The Naval Sea Systems Command has made extensive use of CBIAC to identify strengths and deficiencies in the Navy's NBC research program.

(d) Standards and Standardization

Each of the IACs examined in this study participates in the establishment of either *de jure* or *de facto* standards for the Department of Defense.

CBIAC has become the keeper of technical information needed by the Army and its contractors to identify materials which do not meet, which meet, or which exceed performance specifications for survivability in a toxic environment. As a result of the effective development of a data base on materials properties, CBIAC is becoming the *de facto* keeper of the Army's standard. In addition, other services are relying on the Army's standard for NBC survivability absent their own.

E. OTHER USERS AND OTHER BENEFITS

The preceding two sections have presented the information we have been able to collect about and from identified core and special task users of CBIAC. The discussions in those two sections have tended to focus on those users' quantifications of benefits. It is important to recognize that there are still other users and other benefits of work performed by CBIAC.

1. Users in DoD Programs

The DoD IAC program has been established "in recognition of the important and integral part that information analysis and evaluation activities play in the research and development process...." Each technology thrust area will generally fall under the oversight of a technical program manager within the DR&E staff. That staff member will

have Service counterparts who oversee the Service programs in the thrust area. Each of the Services may have laboratories or other field agencies actively engaged in work in the thrust area. In a sense, this RDT&E program chain is or should be the primary source of users of the IACs in their respective thrust areas.

In the case of CBIAC, the R&AT staff share considerable responsibility with the Assistant to the Secretary of Defense for Chemical Matters, a member of the staff of the Assistant to the Secretary of Defense for Atomic Energy. During the period FY 1986-FY 1988, the R&AT staff relied heavily upon CBIAC for information vital to the day-to-day oversight of the chemical and biological defense program. Since 1988, much of the information formerly shared by CBIAC with DDDR&E/R&AT has been directed to the Office of the Assistant to the Secretary for Chemical Matters. The CBIAC staff was very helpful to the R&AT staff during the period 1987-1988 in collecting and processing information needed to respond to inquiries from the Congress about the scope and direction of American chemical warfare and biological defense programs.

2. Other Users Beyond the Identified Specific IAC Communities

There are those not working in the field of chemical warfare and biological defense who also benefit indirectly from the DoD IAC Program. CBIAC reviews and reports on architectural plans for certain facilities at the Edgewood Area of Aberdeen Proving Grounds have heightened awareness of architectural approaches to minimizing adverse environmental impact of toxic or hazardous materials used in the manufacture of pharmaceuticals, semiconductors, and other industrial processes relying on toxic or hazardous reagents. These reports have use and value far beyond those in the DoD community working with chemical warfare substances or biological defense technologies. CBIAC tasks dealing with mitigation of environmental impact of smoke and obscurants, the use of biological organisms to detect the presence of toxic materials in water, and the proper use of gas masks in the Navy have analogous applications in the civil sector. These reports may lead to important transfer of technology from the Federal to the private sector.

F. SUMMARY

We have been able to quantify the benefits to DoD of several special tasks performed at CBIAC. Significant quantitative and qualitative benefits resulted from the use of CBIAC core program information products and services. Eight core technical inquiries from users resulted in benefits valued in excess of \$850,000. Some seventy-five CBIAC

core users seeking answers to technical inquiries, bibliographic information, or referrals provided us information regarding qualitative benefits resulting from CBIAC use which are summarized in Table 4-11.

Table 4-11. Qualitative Benefits from CBIAC Core Information Products and Services*

Qualitative Benefit	# of Tasks Reporting Benefit
No Defined Qualitative Benefit	11
Verification/Substantiation	22
Objectivity & Neutral Competence	9
Enhanced Productivity	44
Standards and Standardization	6
Enhanced Communication	4
Enhanced Competitiveness	8
Enhanced Military Capability	7

* The total number of benefit types reported exceeds sample size due to multiple benefit types for several tasks.

Table 4-12 reiterates information presented in Table 4-7 above. While we have only a small amount of quantitative data documenting the dollar value of benefits provided by the representative sample IACS, we see that in aggregate, the dollar savings associated with three DoD IACs appear to exceed the annual appropriation for the entire IAC program funded out of the DLA R&D appropriation line.

Table 4-12. Quantitative Benefits From Selected DOD IACs

IAC	# of Tasks with Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
CBIAC	32	\$4,268,000	\$1,407,500	LOWER LABOR RATES DEFERRED PROCUREMENT
	5	\$431,000		

In addition to the quantitative benefits from special tasks discussed above, there were several significant qualitative benefits to DoD resulting from the use of CBIAC. These are summarized in Table 4-13.

Table 4-13. Quantitative Benefits of Selected IAC Special Tasks

IAC	QUALITATIVE BENEFIT	EXAMPLE
CBIAC	IMPROVED CAPABILITY	AIR FORCE BASE DEFENSE AIR BASE OPERABILITY ARMY CW DETECTORS TANK CREW PROTECTION
	IMPROVED TRAINING	NAVY CW TRAINING AIR FORCE MASK TRAINING
	IMPROVED R&D PLANNING	NAVY CW/BW 6.2 PROGRAM ARMY CHEMICAL DEMIL PROGRAM CHEMICAL WARFARE STUDIES
	IMPROVED TESTING	BIOLOGICAL DETECTION SMOKE AND OBSCURANTS PROGRAM AIR FORCE MASK PROGRAM
	NEUTRAL COMPETENCE	EDGEWOOD A&E REVIEW BIOLOGICAL DEFENSE PROGRAM EIS

On the basis of our review, it appears that CBIAC is providing to DoD and its contractors substantial benefits. It appears that CBIAC has a benefit-cost ratio for special studies and tasks in the range of 3 to 1 for those tasks where meaningful cost and benefit data were available.

5. BENEFITS FROM GACIAC

A. INTRODUCTION

The Tactical Weapons Guidance and Control Information Analysis Center (GACIAC), operated by IIT Research Institute, is a repository for information relating to sensors, propulsion, navigation, and munitions included in precision guided munitions. It also holds information on guided munitions effectiveness. GACIAC includes in its collection information on platforms which carry precision guided munitions, as well. GACIAC maintains an extensive library of computer models for simulation and analysis of guided munitions performance. These models are useful throughout design, development, test, and modification of precision guided munitions. GACIAC has some laboratory capability and is used to investigate applications of new materials to problems in the field of precision guided munitions. GACIAC has also been used to conduct "hardware in the loop" simulations related to precision guided munitions and their integration with delivery systems.

GACIAC provides the Defense Technical Information Center (DTIC) with its data base of reports, many of which are already included in the DTIC Reports Data Base. DTIC users have access to the GACIAC file via the Defense Research On-Line System (DROLS), provided that they know to ask for it. GACIAC also publishes and performs primary dissemination its own reports.

Table 5-1 summarizes GACIAC funding for the period FY 1985-FY 1988. This chart again places the size and magnitude of GACIAC core and special task programs in perspective.

The core funds provided to GACIAC by DLA in conjunction with additional funds provided by the services supports a small core staff of the GACIAC Director, two or three professional staff members, two or three information specialists, and a handful of clerical staff. The exact numbers of staff supported by the core funds plus service funds varies from year to year. The special studies program at GACIAC supports a very substantial number of research and technical staff at IIT Research Institute. The number of full-time

equivalent positions varies considerably each year depending upon the nature of the tasks to be performed.

Table 5-1. GACIAC Funding FY 1986-FY 1989

Fiscal Year	DLA Core Funding	Additional Funding by Services*	Special Tasks	Product Sales**	TOTAL
1985	\$390,000	\$50,000	\$2,274,618	\$15,675	\$2,730,293
1986	\$140,000	\$50,000	\$2,746,000	\$36,100	\$2,972,100
1987	\$274,000	\$250,000	\$4,086,500	\$12,190	\$4,622,690
1988	\$326,000	\$787,602	\$3,715,935	\$12,200	\$4,841,737
1989	\$165,000	\$691,025	\$6,693,177	\$94,163	\$7,663,365

* Includes both additional core funding and "block funding" (special tasks for products and services subsequently included in the IAC core program) by military services.

** Includes conference registration fees as well as sales of information products and subscriptions to GACIAC services.

GACIAC occupies a position of special importance to the DoD conventional warfare community. GACIAC is both an IAC and a chartered *ex officio* member of the Joint Service Committee on Guidance and Control (JSGCC). Not only does GACIAC perform all the functions assigned by regulation to a DoD IAC, it also performs executive secretariate functions to the JSGCC as directed by DoD Instruction 5154.26.²¹ The Joint Steering Committee on Guidance and Control has provided considerable financial assistance to GACIAC in recognition of its role as the executive secretariate to the JSCGC in recent years. The GACIAC COTR has been successful in persuading JSCGC members to provide funds in lieu of funds promised in the DLA contract but not provided under the DLA appropriation because of the central role GACIAC plays in the planning, programming, and program evaluation efforts of the JSCGC.

B. CORE PROGRAM DESCRIPTION

GACIAC provides core services to its user community in two categories: general distribution information items and individual response items. During the period for which we examined GACIAC information products and services, it published a long list of documents, reports, and current awareness products available to qualified users with appropriate clearances and need to know. Table 5-2 lists these items.

²¹ DoD Instruction 5154.26, "Joint Service Guidance and Control Committee (JSGCC)."

Table 5-2. GACIAC Core Products, 1985-1988

Introduction to Precision Guided Munitions
Properties of Optical Materials
Phase Transition of Sulfides, Selenides, and Tellurides
Polarimetric Radar Technology Workshop, Volume 1
Proceedings of the Symposium on Target Acquisition and Strike--The Seeker Design Program
Second Workshop on Polarimetric Radar Technology, Volume 1
Proceedings of the 1985 Producibility of Millimeter Wavelength Monolithic Integrated Circuits
Proceedings of the Workshop on Automation and Robotics for Military Applications
Review of Electro-Optic System Vulnerability to Laser Radar
High Power Millimeter Wavelength Tubes and Lasers
Characterization of RF Sensors/Seekers
Focal Plane Arrays
Anti-Tactical Missile Guidance and Control Technology
Vanadium Oxide Coatings and Their Uses
State-of-the-Art Review: Review of Microwave and Millimeter Wave Monolithic Integrated Circuits
Tri-Service Seeker Technology Tasks, Second Edition
Domestic Technology
Sacrificial Filter
Precision Guided Munitions Technology Topical Review
A Survey of Radar Clutter Measuring Data
Proceedings of the Workshop on Radar Absorbing and Armor Composite Materials
Proceedings of Military Applications of Electro-Acousto-Optic (EAO) Technology Conference
1986 Producibility of Millimeter Wavelength/Microwave Length Integrated Circuits Conference
Millimeter Wavelength/Microwave Length Measurements and Standards for Miniaturized Systems
Conference, 1986
State-of-the-Art Review: Cryogenic Cooling of Infrared Electronics
Small Munitions Primer and Briefing Manual

GACIAC provides a wide range of information products based on its core program on and individual response basis. Among the services provided in this category are the following:

- Bibliographic Searches
- General Information Responses
- Technical Inquiry Responses
- Papers, Manuscripts, Document Requests
- Referrals to Experts, Other Information Resources.

During our study, we attempted to determine the benefits of GACIAC core program information products and services. The results of our review are described below.

C. BENEFITS FROM THE CORE PROGRAM

1. Types of Core Products and Services

As illustrated in Table 5-2, GACIAC has an extensive list of publications which are generally available to government and DoD contractor personnel with appropriate clearances and need to know. GACIAC also publishes a quarterly newsletter. The Director of GACIAC also publishes a weekly newsletter intended for members of the JSGCC. The GACIAC staff are very helpful and provide a wide range of technical inquiry, bibliographic inquiry, and referral services.

GACIAC provided IDA with a complete listing of 289 Individual Response core services for the period, calendar year 1988. Table 5-3 provides a breakdown of the kinds of organizations requesting Individual Response Core Services during FY 1988. Table 5-4 summarizes the types of services or information provided on an individual response basis by GACIAC.

In order to identify specific benefits to DoD and its contractors, we asked GACIAC to identify individual response core information products and services for calendar year 1988 by product or service type. This information is presented in Table 5-4.

On the basis of the list of calendar year 1988 individual response users, we undertook an extensive telephone survey. We attempted to contact as many of the identified individual recipients as we could reach to conduct a survey of benefits and costs of IAC core products and services. The results of our survey are described below.

**Table 5-3. GACIAC Core Individual Response Users, FY1986-1988:
Classification by Organization Type**

Department of Defense	
Air Force	24
Army	57
Navy	39
OSD	1
Other DoD	7
Department of Defense Contractors	141
Other U.S. Government Agencies	5
Academic/Professional	12
Private Industry	3
GACIAC Core Individual Response Task Population	289

**Table 5-4. GACIAC Individual Response Core Services Provided,
By Service Type, CY 1988**

Bibliography	9
Conferences	4
Documents	43
General Information	2
GACIAC Core Individual Response	56

2. Benefits of General Distribution Products

In the case of the GACIAC newsletter, the survey data collected by GACIAC shows strong user support for and satisfaction with the GACIAC newsletter. In the case of other GACIAC, CBIAC, and RAC products, we found a small number of surveys returned to IACs by users, nearly all of which expressed appreciation for the quality and utility of the IAC products. It is likely that users of the IACs who were not especially satisfied failed to return questionnaires along with other satisfied users who were simply too busy to tell the IACs about their use of IAC supplied information. In general, IAC's limited success in stimulating replies to its mailed surveys discouraged us from attempting a broad survey of core general distribution products.

Due to the widespread distribution of GACIAC state-of-the-art reports, critical reviews, and other current awareness products, we determined it would be uneconomical to expend study resources to attempt to assess the benefits to DoD of such products. However, during our interviews with core program users who had requested specific,

individualized information products or services, we were told of benefits that accrued not only from the individual response items, but the general distribution items noted above as well. Although we did not keep statistics on such benefits, there were strong sentiments expressed by many users with whom we spoke that GACIAC general distribution documents were very helpful in promoting standardization and enhancing communication.

Conference proceedings, in particular, were singled out by many users of other GACIAC core products and services as being particularly helpful. Such proceedings often captured technical information within weeks or months after its generation. GACIAC was singled out by several users as an exceptionally responsive and responsible organization for making available information from classified conferences dealing with precision guided munitions technology.

3. Benefits of Individual Response Services

In order to better understand the benefits and costs of core products and services to GACIAC users, we sought out a sample of individual response products or services to be interviewed by telephone. Our sample focused on those users who received either a bibliography or an answer to a technical inquiry. Of the 283 GACIAC users identified as having received bibliographies, referrals to other sources, or answers to technical inquiries, we were able to interview 50 users. Most of the document recipients were technical information specialists, librarians, or other information conduits. In addition, GACIAC provided us with disposition forms for nine clients who had received bibliographies; of this number, we were able to contact seven of them. Therefore, few users we contacted were able to quantify the benefits that GACIAC provided their organization.

In addition to these 50, we spoke with other users who acted as intermediaries between GACIAC and bench level scientists, engineers, or researchers. Most of these additional conversations were with librarians, many of whom could not identify specific benefits. They did report that their users found GACIAC beneficial because they were continually directed to use GACIAC, even if it was difficult to obtain GACIAC documents.

Subsequent to our visit to GACIAC and follow-up telephone calls, GACIAC implemented new procedures to assist users in ordering documents. It is our understanding that the flow of information from GACIAC to its users has accelerated. Clearly, the users with whom we spoke found the general distribution publications of value, especially in facilitating communication within the precision guided munitions community, and wanted better access to these publications.

Table 5-5 summarizes the general results of our sample of IAC core Individual Response services at GACIAC.²² We were able to contact representatives of all three military services as well as significant contractors to DoD involved in precision guided munitions RDT&E.

**Table 5-5. GACIAC Core Users Survey--Individual Response Service Users
CY1988**

User Agency	
27	DoD Users
26	DoD Contractors
2	Other U.S. Government Agencies
1	Commercial Ventures
Nature of Task	
9	Critical/Annotated Bibliographies
4	Conferences
43	Documents
2	General Information
Amount of Quantified Benefit	
1	Core Funded Task Reported A Quantified Benefit
Methods Used to Quantify Benefits by Users	
Benefit of task quantified on basis of time or effort saved	

As in the case of CBIAC, GACIAC is providing core information via individual response to inquiries or referral requests to representatives of all three military services, components of the Department of Defense, DoD contractors, and other U.S. Government agencies.

The following discussion summarizes information collected and presented in Appendix E to this report.

(a) Quantitative Benefits

Most GACIAC users with whom we were able to speak work in environments where quantifying research and development work output is not done. Even upon extended prompting, GACIAC users could not readily conceptualize the costs they would

²² It should be borne in mind that this sample was generated primarily on the basis of our ability to identify individual users and contact them by telephone.

have incurred had they gone elsewhere for information provided by GACIAC. They could not assign a value to the amount of time GACIAC had saved them, nor could they estimate the value to their organization of changes in organizational plans, programs, or behaviors as a result of an answer or other information item provided by GACIAC.

There was, however, one individual who did indicate that GACIAC provided him with a quantifiable benefit based on documents provided. While he described the chief benefit that GACIAC documents had provided him as one of providing support for the work he was doing at the time, he indicated that had he had to search for similar information for himself, he would have spent six to seven weeks in the library. Thus, the minimum benefit reported by this user was 6 to 7 weeks of saved professional labor.

Four other GACIAC customers described quantifiable benefits, but failed to provide or were unable to attach numbers to the savings. All four described the benefits of GACIAC assistance generally as savings in terms of time. One user had come uninitiated into the area of guidance and control. He explained that if he had to find out what technologies were available and what other people were doing, he could have done so, at a cost of time and manpower.

Another user described his time savings in terms of shortened development time. Because of referrals that GACIAC provided, he was able to go directly to companies that were working in areas he was interested in. Like the first user, he stated that he could do the work that GACIAC had done for him, but that he did not have enough time. As a result of their input and the information provided by their referrals, he was able to find out what did and did not work, so he was able to shorten development time significantly.

A government customer used documents prepared by GACIAC as entry level training manuals. He indicated that he, too, could provide similar information (in this case technical training manuals) but knew for fact that it would take many months to develop something similar. There was a further saving in the amount of time it took his new engineers to come up to speed in Air Force-specific areas. As he pointed out, many of the engineers were very well trained in general engineering areas; however, specific guidance and control areas are rarely discussed in most college and university engineering and science courses.

Finally, a government librarian was able to report a time saving. The librarian, who was not the prime user of the GACIAC documents, reported that GACIAC was very responsive--significantly more so than alternative sources she had to work with. In this

particular case, responsiveness meant that they not only sent what she requested, but they sent it to her promptly and directly.

In summary, all the benefits were the result either of time and effort saved or, in the case of the librarian, of not having to go to an alternate source. The engineer, who quantified a time saving, indicated he saved 5-7 weeks of labor. An arbitrary value of \$30.00 per hour (fully loaded) for a junior engineer provided an estimated cash savings of \$7,200-\$8,400. The other four quantifiable, but unquantified, benefits result from time savings.

(b) Qualitative Benefits

As mentioned earlier, most of the GACIAC users interviewed were recipients of documents. In the case of GACIAC, the recipient typically was a third party who did not actually use the documents himself. Even though GACIAC users with whom we spoke were not intimately familiar with the documents that arrived for use in their companies' research and development efforts, most were able to describe some benefit from the information provided.

As in the case of CBIAC, the benefits described fall into one or more of the following categories:

- Verification of information;
- Absolute objectivity;
- Enhanced productivity;
- The ability to work to standards (in some cases, the standards the IAC helped to produce);
- Greater competition;
- Enhanced communication; and
- Improved military capability.

Each of these defined benefits will be discussed in greater detail below.

(i) Verification/Substantiation

Verification of information does not merely include an IAC's stating that the information is correct; it includes enhancing the confidence that the IAC user has about his technique or solution. In the survey, two GACIAC users reported that the IAC they had

used had provided significant benefit by verifying or substantiating data obtained from other sources.

(ii) Objectivity and Neutral Competence

Objectivity was another important benefit for users included in our current study. Two GACIAC users reported going to the IACs because they were objective. One user reported, particularly in the case of state-of-the-art reviews, GACIAC's objectivity was critical since it had no particular institutional or programmatic prejudice. In addition, he believed that because GACIAC was independent and carried a quasi-governmental flavor, for-profit companies would be more willing to discuss proprietary information with it.²³

(iii) Enhanced Productivity

Four GACIAC users reported that they used various handbooks, critical reviews, and state-of-the-art reports as technical manuals and primers to train new staff members. According to these interviewees, use of the GACIAC documents substantially improved the performance of the engineers and technical support staff. The information contained in each is focused, directed, and topical, and more nearly meets the needs of the new government or government oriented engineer than other academic or commercial texts.

Three GACIAC users reported savings of time and effort based on avoiding a need to perform expensive laboratory tests. These GACIAC users saved time and resources by not conducting tests which would have unnecessarily duplicated existing data and information. They were able to use their personnel, laboratory, materiel, and financial resources for more productive purposes. Unfortunately for this study, they were unable to quantify the savings.

Five GACIAC users reported increased productivity or enhanced efficiency in their day-to-day research activities. The specific qualities of improved productivity or enhanced efficiency cited were shortened learning time, improved quality assurance/quality control, and improved labor productivity. Again, the users were unable to quantify these descriptors of "improved productivity."

²³ We found few commercial organizations who were IAC users who objected to providing proprietary information to DoD IACs. As long as the companies which generated proprietary data remained confident that such information would be protected from unauthorized use by their competitors, they were pleased to provide the IACs with such information.

Two GACIAC users reported using information provided by GACIAC to justify and make design changes.

(iv) Standards and Standardization

One GACIAC user reported that his agency and GACIAC were involved in related areas of guidance and control. Standards for guidance and control systems prepared with the assistance of GACIAC made it possible for this user to map data points in an experiment he was conducting. This task would not have been accomplished without the basic standards for technical data related to guidance and control established by GACIAC. Handbooks and models prepared by GACIAC figure prominently in the deliberations of the Joint Technical Coordinating Group on Munitions Effectiveness.

(v) Enhanced Communication

One of the most commonly mentioned benefits provided by GACIAC was that it provided a forum to permit wide-ranging technical discussions between government and industry; among various government agencies; and with industry with respect to the state-of-the-art in the field of tactical weapons guidance and control. Government representatives stated that because of GACIAC's involvement in conferences, seminars, and working groups, they were well aware of what was occurring at other government laboratories and agencies. As one government scientist put it, because of GACIAC he was no more than three months behind the power curve at any given time. Additionally, the contact with his peers gave him a "heads up" as to documents and studies to be released. Another DoD scientist stated that often government and industry do not communicate well with each other--industry does not understand why government pursues the courses it does and government sometimes appears to be insensitive to the needs of industry.

As a result of GACIAC's conferences, symposia, working groups, and workshops, and the resulting conference proceedings, both the public and the private sector are able to discuss what they are doing and why. It helps to clear up misunderstandings and prevents situations from becoming problem areas. This sentiment was echoed by a member of the private sector who stated that he was able to do a better job working in his area (missile seeker technology) because of the cross fertilization between industry and the government.

(vi) Enhanced Competitiveness

None of GACIAC's users with whom we spoke identified GACIAC as a source of information which had assisted in making informed bid/no bid decisions on government procurements. None specifically identified GACIAC as a source of information used to support preparation of responses to solicitation. However, two users did cite GACIAC as a source of information used to justify or make design changes. This suggests that GACIAC information could be used in the future to enhance competition.

(vii) Improved Military Capability

Two users who are engaged in operational test and evaluation activities told us independently that the PGM Handbook produced by GACIAC is used as a primary training document for personnel engaged in flight test operations of precision guided munitions. Since many of these fliers rotate from active units in the fleet and return after short tours at the user's facility, the improved training for purposes of operational test and evaluation translates into improved military capability in very short order.

Another user located in laboratory environment in which training of military personnel involved in field activity occurs reported similarly that the use of GACIAC handbooks was a valuable tool which resulted in improved productivity for the engineers assigned from field units to the laboratory on temporary duty. These individuals returned to their units in the field more capable at least in part because of their use of GACIAC information, and thereby improved operational readiness and military capability.

D. BENEFITS FROM SPECIAL TASKS

1. Background

As in the case of CBIAC, the study methodology to assess benefits of special tasks was quite straightforward. We examined the list of special tasks provided by GACIAC for the period FY 1987-FY 1988 to determine whether there were either individual heavy users of each IAC or geographic concentrations of heavy users, and found that we could cover most of the users with only a few trips. Utilizing a questionnaire to provide a framework for data collection, we conducted interviews with special task users of GACIAC. We did find special tasks initiated in FY 1986 and FY 1987 considerably harder to assess. In these more dated tasks, many of the requiring organizations had been merged into other organizations or reorganized out of existence. Many of the individuals most familiar with

the results of the task and the subsequent use of information had frequently rotated to new positions.

Table 5-6 characterizes the population of special tasks of which we were aware at the beginning of the current phase of our study for each of the IACs.

Table 5-6. Sample IAC Special Task Users by Military Service

SERVICE	GACIAC
Air Force	3
Army	15
Navy/Marines	5
OSD	0
Other USG	
Total Population	24

We were able to collect data through interviews on 20 GACIAC tasks.²⁴ Data was collected through hour long interviews followed up from time to time by additional telephone conversations or correspondence. Table 5-7 captures the degree to which our study was able to cover the special tasks undertaken by each IAC.

Table 5-7. Coverage of Special Tasks by Representative Sample Study

	Air Force		Army		Navy	
	Tasks	Dollars	Tasks	Dollars	Tasks	Dollars
GACIAC	100%	100%	75%	94%	100%	100%

During this phase of our study, we attempted to better understand the source of funds being used to support special studies being performed by DoD IACs. Table 5-8 illustrates the diversity of budget categories for IAC special studies examined during the course of this phase of our study.

²⁴ For purposes of simplifying travel planning and analysis of data, we have treated multiphase special tasks conducted for the same requiring activity as one task even though the IACs will report each phase as a separate task. As a result, we understate by a small margin the number of tasks actually reviewed for each IAC covered in this report in comparison with the number of tasks reported by the IAC Program Office at DTIC.

Table 5-8. Budget Categories of Special Studies Performed by Three DoD IACs

Budget Category	AF	CBIAC AR	N
Unknown	8		
6.1			
6.2	4	6	1
6.3A	4	5	
6.3B			1
6.4			2
O&M			1
Procurement			

This table treats each occurrence of a budget category as a discrete source of funds even though there are several instances in which funds from multiple budget categories are used to support one task.

As was the case with CBIAC, the GACIAC Director and the GACIAC Technical Monitors (COTRs) were generally unaware of or uncertain about the category of funds being expended at GACIAC in the procurement of special studies. We were able to identify the category of funds being used to procure a special task only by talking with the special task requiring activity. In the cases of tasks conducted in 1985 and 1986, many of the technical monitors for those tasks have moved on in their careers or left government, making it difficult to acquire accurate data about funding, costs, benefits, and uses of special task generated information.

2. Summary Results

We found only 5 special task users from a sample population of 14 GACIAC special task users able to present evidence of a quantified benefit measured in dollars. The results shown in Table 5-9 illustrate that the benefits outweigh the contract costs for those special tasks where quantitative benefits could be identified and substantiated. The data underlying this table will be discussed in greater detail below.

We also found several IAC special task users who described the results of IAC special tasks in terms that lead us to believe at some future point in time it will be possible to quantify the benefits of the IAC work; it is not possible to do so at this time. Finally, we found several IAC users who told us of benefits that had been received from the work

performed by an IAC which were important to their programs but could not now be quantified nor was it ever likely that such benefits would be quantifiable.

Table 5-9. Quantitative Benefits From Selected DOD IACs

IAC	# of Tasks With Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
GACIAC	14	\$5,286,000	\$5,045,000	LOWER LABOR RATES REDUCTION IN FIELD TEST TIME ACCELERATION OF R&D
	5	\$1,642,000		

Table 5-10 summarizes the results of our efforts to categorize the benefits reported by special task users of GACIAC, in terms of quantified, quantifiable, defined and undefined benefits. As the table makes clear, most special task users with whom we spoke were able to define the benefits of IAC special tasks for their research and engineering programs; they were frequently able to define the benefits of special tasks in terms that might permit quantification of benefit in terms of dollars saved or hours saved at some future point in time. Several users reported benefits that might at some future point be reported in terms of improved performance of military personnel as measured by standard training techniques.

Table 5-10. Benefit Categories Reported by Special Task Users of GACIAC, CBIAC, and RAC

Benefit Type	GACIAC
Not known	4
Quantified	5
Quantifiable but no data available	4
Defined but not quantifiable	10
Not defined	1

It should be noted further that several users reported benefits that were both quantifiable as well as defined but not quantified--e.g., future improvements in military

personnel performance in training (quantifiable) and enhancement of deterrence (not quantifiable).

3. Quantitative Benefits Assessment

We identified 20 special tasks conducted by GACIAC on behalf of various U.S. Government sponsors. Of this number, we were able to obtain detailed information on 14 tasks, several of which spanned two or more fiscal years. Of these 14 tasks, five special task users who spent \$1,767,000 in aggregate for their respective special tasks reported benefits valued at \$5,045,000. Table 5-11 summarizes data collected on those special tasks in which users provided sufficient data to establish quantitative benefits to DoD from GACIAC special tasks.

Users at the Army's Vulnerability Assessment Laboratory asked GACIAC for assistance in characterizing electrooptical information needed to assess countermeasures and counter-countermeasures for various precision guided munitions. These users reported that the preliminary results of a \$657,000 task have already netted benefits of \$750,000; further results from this series of special studies are eagerly awaited.

GACIAC analysis of materials used in Air Force precision guided munitions programs were valued by the program manager in terms of a 2 to 1 improvement in the processing of new materials. IDA placed a minimum dollar value of benefit to the Air Force resulting from this task of \$770,000. A special study undertaken on behalf of the Pacific Missile Test Center to improve the performance of the Aegis guided missile cruiser's anti-aircraft systems has resulted in benefits to the Navy valued in excess of \$300,000. Of those special task users who reported quantifiable benefits, one of the most dramatic assessments of benefit came from the Pacific Missile Test Center. This special task resulted in the development and use of a test range model to improve overall mission planning and effectiveness; the benefits accruing from this task include dollars saved in improved efficiency and economy of operations; improved range safety; better test results for equivalent expenditure of test resources; and improved range planning. IDA staff estimates the minimum benefit resulting from this task is \$2.5 million. GACIAC also undertook a task for the U.S. Army Missile Command which involved the integration of test data and the preparation of revised test plans based on data submitted by two contractors. The user estimated savings of labor by his staff and the contractors at twice the value of the task. IDA staff estimated the dollar value of these savings to be \$600,000.

Table 5-11: Quantitative Benefits of Selected GACIAC Special Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
Core	US Army, Army Missile Command, Redstone Arsenal, AL 35898-5246	Pullman, Mr. William	COMETHODOCKS AND CONFERENCES		Organized and ran joint NASA Redstone Arsenal Conference on robotics.	Rapid transfer of technology of particular interest to DoD and its contractors; problems, conflicts of view, conflicts in data interpretation surfaced early in the acquisition process within a DoD chain while there is still time to plan for alternatives.	Savings measured in terms of years, \$ millions of RDT&E labor hours; none specifically quantified	
GAC 001A3	US Army Vulnerability Assessment Laboratory, SLCVA-FM, White Sands Missile Range, NM 88002-5513	Demoulin, Dr. D. (805) 678-3471	E O AIR TO SURFACE MISSILE INVESTIGATION PHASE III, (CHANGE I)	\$667,000.00	Provide comparability methodology and data on various EO guidance systems countermeasures, and basis for selecting improved guided missile system designs.	1. Reduction in costs of procurement contract. 2. Reduced costs and improved availability achieved through use of standard electronic components for which test equipment and supplies are already available.	1. \$750,000 of known reduction in costs of procurement contract. 2. Data not yet available. 3. Not quantifiable.	1. Contract cost reduction 2. Not yet calculated, data not yet available on reduced costs and improved availability achieved through use of standard electronic components for which test equipment and supplies are already available.
GAC 001A3	US Air Force Wright Aeronautical Laboratory, Materials Laboratory AFWAL/MLPJ, Wright Patterson AFB, OH 45433-6533	Slawson, Dr. D.F. (613) 255-3808	ADVANCED LASER HARDENED OPTICAL MATERIALS SYNTHESIS, PHASES I AND II	\$335,000.00	Develop techniques to measure monitoring and control of optical filtering; integrate data and data collection procedures from 10 contractors; task has run for 3 years and will be extended for a 4th year.	Technology advancement; lower weapon system component costs to DoD because the components are not specific to a very small DoD market; value of GACIAC work inestimable in terms of time and labor dollars compared to in house (5 years time N people).	Preliminary estimate is \$770,000	Compared and contrasted costs of obtaining a specific process outcome with given process and new process controls to achieve same output. Preliminary estimate of improved productivity.
GAC 001A3	US Navy, Pacific Missile Test Center, Point Mugu, CA 93042-5000	Lozupich, Mr. Diana and Mr. Garry Eason (805) 939-9072	MISSILE FLIGHT TEST PLANNING SUPPORT	\$360,000.00	Support for Aegis and related mission planning.	Tool developed to improve planning of tests of Aegis and other weapon systems on PMTC range; device also useful in evaluating range instrumentation requirements; further utility in range safety planning for each test; analytical techniques transferable	Savings estimated at \$2,625 million for Aegis Program alone.	\$50K/hour of range time x 5 hours/test x 8 tests for Aegis now reduced to only 5 tests or \$750,000 per ship; 3 to 4 ships tested per year = \$2,625,000 saved per year. DDG 51 class will have 31 ships to be tested at same rate

Table 5-11: Quantitative Benefits of Selected GACIAC Special Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
GAC 0018C	US Army Missile Command, AMS&M RD-AS-IR, Redstone Arsenal, AL 35898-5248	Passmore, Mr. Ron (205) 876-1989	DUAL MODE AND IF SEEK/SENSOR TECHNOLOGY AND ANALYSIS SUPPORT	\$300,000.00	Test planning: integrate inputs from 2 contractors to coordinate, unify preliminary results and review designs for additional testing; Modeling and Analysis of dual mode seeker benefits compared to a single mode.	Schedule coordination has resulted in acceleration of acquisition process by a few months; coordination has improved quality of data; comparability of data submitted by various contractors; Modeling effort has improved knowledge of sensor fusion.	> \$600,000	Labor rates of government versus GACIAC for equivalent work: 2 to 1 benefit-cost ratio in terms of direct labor cost GACIAC vs USG alone; also savings in terms of alternative uses of government employees' time; cost avoidance in terms of not having to b
GAC 0018E	US Navy, Pacific Missile Test Center, Code 404022, Point Mugu, CA 93042-5000	Kroque, Mr. E. P. (805) 989-3583	ECM/ECM ANALYSIS OF AEGIS, PHASE 1	\$125,000.00	ECM technology for live control radars and missile radars of the AN/SPY-1 Aegis radar; GACIAC analyses AN/SPY-1 radar and SM2 to help dc. de design and program test jammers; analysis of technological bases for threat to AN/SPY-1 radar and SM2 radar; data	Improved operational capability for current systems; improved test and evaluation procedures for PJ1 and new systems.	At least \$300,000.	Actual cost versus estimated direct costs of doing in-house without regard to time savings or quality improvement. GACIAC more expensive than in house staff; no staff available for work done by G. CIAC; if GACIAC not avail

4. Qualitative Benefits Assessment

We found many special task users of GACIAC unable or only partially able to quantify the benefits they received from using a DoD IAC. On the other hand, these users were able to describe other contributions of the work performed by IACs included in our study which are of special significance to DoD, even if the benefits cannot be quantified in a direct or meaningful way. Table 5-12 summarizes qualitative benefits reported by special task users of GACIAC.

(a) Improved Military Capability

Several GACIAC special task users identified several special tasks with direct impact on the capability of U.S. military forces. Work performed by GACIAC for the Pacific Missile Test Center on the AEGIS radar system has contributed directly to improved electronic countermeasures and electronic counter-countermeasures. Studies undertaken for the Naval Weapons Center on the STINGER missile have resulted in changes to the missile which have improved its performance. Work undertaken by GACIAC at the Army's Vulnerability Assessment Laboratory has led directly to improved electrooptical countermeasures and counter-countermeasures.

(b) Objectivity and Neutral Competence

In the case of one GACIAC task, MICOM has asked GACIAC to look into serious allegations of poor weapon system performance. In seeking GACIAC's assistance, MICOM concluded that other elements of the Army and the weapon system prime contractors had too large a potential conflict of interest in evaluating the system's performance. Accordingly, GACIAC was selected for the analysis of data on weapon system performance because it had minimal interest in an *a priori* outcome.

(c) Enhanced Productivity

Many special task users of GACIAC, CBIAC, and RAC asserted in general terms that the results of IAC special tasks were general increases in the productivity of their own organization. In particular, the GACIAC-sponsored conferences for MICOM on materials and robotics were identified as significant accelerators of the R&D process by several MICOM attendees. Staff of the Air Force Materials Laboratory expressed similar views about the value of other GACIAC conferences or projects undertaken with their sponsorship.

Table 5-12: Qualitative Benefits of Selected GACIAC Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
Core	US Army, Army Missile Command, Redstone Arsenal, AL 35898-5246	Martin, Brenda	Workshop on Polarmetric Technology		Organize and conduct workshop on polarmetric technology at the SECRET level.	Identify and address problems associated with systems development; bring together researchers and engineers early in the life of a system before designs are set in concrete; identify alternative approaches and technologies;	None quantified	
Core	US Army, Army Missile Command, Redstone Arsenal, AL 35898-5246	Pittman, Mr. William	CORE INTRODUCTIONS AND CONFERENCES		Organized and ran joint NASA Redstone Arsenal Conference on robotics.	Rapid transfer of technology of particular interest to DoD and its contractors; problems, conflicts of view, conflicts in data interpretation surfaced early in the acquisition process within a DoD chain while there is still time to plan for alternatives;	Savings measured in terms of years, \$ millions of RDT&E labor hours; none specifically quantified	
SOAR	US Army, Army Missile Command, Redstone Arsenal, AL 35898-5246	Pasamore, Mr. Roy; Focal Plane Array State of the Art Report and Mr. Emily Van Oliver	Focal Plane Array State of the Art Report		Prepare a State of the Art Review of Focal Plane Array Technology for Missile Guidance.	Quick summary, used to reorient and refuel program	None quantified	
GAC 0011AA	US Navy, Naval Weapons Support Center, Applied Sciences Department, Crane IN 47522	Pepke, Mr. Norman and Mr. Jerry Kemp (812) 854-3512	STINGER SIMULATION MODEL	\$100,000.00	Build model of Stinger Seeker (simulation).	DoD has ability to understand Stinger Seeker performance, identify countermeasures based on technology, and develop counter-countermeasures -- combat capability directly affected; also have much better understanding of the technology of counter and coun	None quantified	

Table 5-12: Qualitative Benefits of Selected GACIAC Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
GAC 001AB	US Army Vulnerability Assessment Laboratory, SLCVA-FM, White Sands Missile Range, NM 88002-5513	Demeulin, Dr. D. (505) 878-3471	E-O AIR TO SURFACE MISSILE INVESTIGATION PHASE III, (CHANGE 1)	\$857,000.00	Provide comparability methodology and data on various EO guidance systems countermeasures, and basis for selecting improved guided missile system designs.	1. Reduction in costs of procurement contract. 2. Reduced costs and improved availability achieved through use of standard electronic components for which test equipment and supplies are already avail	1. \$750,000 of known reduction in costs of procurement contract. 2. Data not yet available. 3. Not quantifiable.	1. Contract cost reduction 2. Not yet calculated, data not yet available on reduced costs and improved availability achieved through use of standard electronic components for which test equipment and supplies are already a
GAC 001AG	US Army Vulnerability Assessment Laboratory, SLCVA-FM, White Sands Missile Range, NM 88002-5513	Hopper, Mr. C. (505) 878-2026	DEVELOPMENT OF AN OPERATION SYSTEM FOR A COUNTER MEASURES SIMULATION FACILITY, PHASE I and II (Two Tasks)	\$340,000.00		The facility when completed will enable VAL to determine the vulnerability of various missile guidance systems to various countermeasures and to evaluate the effectiveness of various counter countermeasures. The result will be improved PK for US missiles	Not Quantifiable	Do not have a cost yardstick. The task is in support of the design of a one-of-a-kind R&D capability for simulating missile guidance systems, countermeasures to those systems, and counter countermeasures to improve battlefield success.
GAC 001AJ	US Air Force Wright Aeronautical Laboratory, Materials Laboratory AFWAL/ML PJ, Wright Patterson AFB, OH 45433-6533	Stevenson, Dr. D.F. (513) 255-3808	ADVANCED LASER HARDENED OPTICAL MATERIALS SYNTHESIS, PHASE I AND II	\$338,000.00	Develop techniques to measure monitoring and control of optical filtering; integrate data and data collection procedures from 10 contractors; task has run for 3 years and will be extended for a 4th year.	Technology advancement; lower weapon system component costs to DoD because the components are not specific to a very small DoD market; value of GACIAC work inestimable in terms of time and labor dollars compared to in house (5 years time N people).	Preliminary estimate is \$770,000	Compared and contrasted costs of obtaining a specific process outcome with given process and new process controls to achieve same output. Preliminary estimate of improved productivity.
GAC 001AK	US Air Force Wright Aeronautical Laboratory, Materials Laboratory AFWAL/ML PJ, Wright Patterson AFB, OH 45433-6533	Spry, Dr. R. (513) 255-6671	OPTICAL SWITCH MATERIALS DEPOSITION RESEARCH	\$60,000.00	Evaluate specific materials supplied by other manufacturers for use as optical filters to protect optical filters from laser damage.	Improved combat capability in the future	None quantified	

Table 5-12: Qualitative Benefits of Selected GACIAC Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
GAC 001A1	US Navy, Naval Weapons Support Center, Code 502, Crane, IN 47522	Hickox, Mr. Lyman (812) 854-3612	SA-N-3 SAMILLATION FOR NSAMS, PHASE 1	\$25,000.00	Develop model of naval SAMs so that more realistic countermeasures could be developed.	Improved R&D capabilities; improved training capabilities; better threat definition	None quantified	
GAC 001A1	US Army, Army Missile Command, Smart Munitions Program Office, AMSM RD SM, Redstone Arsenal, AL 35898-5248	Race, Mr. Howard, (205) 878-3172	SMART MUNITIONS DEEP BATTLE-AIM COUNTERFORCE SENSOR SYSTEMS MODELING AND ANALYSIS	\$1,400,000.00	Preparation and analysis of analytical models to aid in evaluation of smart munitions characteristics and effectiveness against various types of targets.	Analytical results permit evaluation of alternative munitions concepts before expenditures of large sums for prototype development and test; models permit development of operations techniques to employ new munitions for maximum effect.	None quantified	
GAC 001A5	US Navy, Pacific Missile Test Center, Point Mugu, CA 93042-5000	Lotweld, Ms. Diana and Mr. Gerry Beeson (805) 989-5072	MISSILE FLIGHT TEST PLANNING SUPPORT	\$350,000.00	Support for Aegis and related mission planning.	Tool developed to improve planning of tests of Aegis and other weapon systems on PMTC ranges; device also useful in evaluating range instrumentation requirements; further utility in range safety planning for each test; analytical techniques transferable	Savings estimated at \$2,825 million for Aegis Program alone.	\$50K/hour of range time x 6 hours/test x 8 tests for Aegis now reduced to only 5 tests or \$750,000 per ship; 3 to 4 ships tested per year = \$2,825,000 saved per year. DDG 51 class will have 31 ships to be tested at same rate
GAC 001A1	US Army, Army Missile Command, Smart Munitions Program Office, AMSM RD SM, Redstone Arsenal, AL 35898-5248	Race, Mr. Howard, (205) 878-3172	SMART MUNITION SYSTEMS AND TECHNOLOGY (IR/ANM) ASSESSMENT PHASES 1 AND 2	\$1,233,000.00	Perform studies and analysis of materials and concepts for smart munitions employing new infrared and millimeter wave sensors.	Improved understanding of technological hurdles to be overcome in design, development, test, and operation of new IR and ANM smart munitions	None quantified	

Table 5-12: Qualitative Benefits of Selected GACIAC Tasks

TASK ID	USER AGENCY	CONTACT	TASK TITLE	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
GAC 001AY	US Air Force, Wright Aeronautical Laboratories, AFWAL/MLPJ, Wright Patterson AFB, OH 45433	Spy, Dr. R. (513) 255-4871	IR RECTANGULAR LOOP FILTERS	\$50,000.00	Investigate uses of superconducting materials for IR filters for microlithography.	New information which may lead to new advances in several classified areas	None quantified	
GAC 001BB	US Army, Army Missile Command, Smart Munitions Program Office, AMSM/RU SM, Hudson Arsenal, AL 35898-5248	Race, Mr. Howard (205) 878-3172	DESIGN AND IMPLEMENTATION OF OF A SMPO INFORMATION ANALYSIS DATA BASE	\$143,000.00	Development of data base to support technology and project tracking for the Smart Munitions Project Office.	Technological currency for SMPO staff and program management resulting in improved project management and better utilization of scarce SMPO resources.	None quantified	
GAC 001BC	US Army Missile Command, AMSM/RD AS-IR, Redstone Arsenal, AL 35898-5248	Passmore, Mr. Ron (205) 878-1889	DUAL MODE AND IR SEEKING SENSOR TECHNOLOGY AND ANALYSIS SUPPORT	\$300,000.00	Test planning: integrate inputs from 2 contractors to coordinate, unify preliminary results and review designs for additional testing; Modeling and Analysis of dual mode seeker benefits compared to a single mode.	Schedule coordination has resulted in acceleration of acquisition process by a few months; coordination has improved quality of data, comparability of data submitted by various contractors; Modeling effort has improved knowledge of sensor fusion.	> \$800,000	Labor rise of government versus GACIAC for equivalent work; 2 to 1 benefit-cost ratio in terms of direct labor cost GACIAC vs USG alone; also savings in terms of alternative uses of government employees' time; cost avoidance in terms of not having to
GAC 001BE	US Navy, Pacific Missile Test Center, Code 40402.2, Point Mugu, CA 93042-5000	Kroeger, Mr. E. P. (805) 889-3583	ECM/ECM ANALYSIS OF AEGIS, PHASE I	\$125,000.00	ECM technology for the control of radar and missile radars of the AN/SPY-1 Aegis radar, GACIAC analyses AN/SPY-1 radar and SM2 to help decide design and program test jamming; analysis of technological bases for threat to AN/SPY-1 radar and SM2 radar; data	Improved operational capability for current systems; Improved test and evaluation procedures for P31 and new systems.	At least \$300,000	Actual cost versus estimated direct costs of doing in-house without regard to time savings or quality improvement. GACIAC more expensive than in house staff; no staff available for work done by GACIAC; if GACIAC not avail

In several instances, users of GACIAC, CBIAC, and RAC singled out the IAC special tasks for important contributions in weapon system testing and evaluation. As noted earlier, GACIAC played a major role in improving the quality of information collected during missile tests by the Pacific Missile Test Center. GACIAC has also been instrumental in improving the quality of test information collected by the Army Test and Evaluation Command.

Both GACIAC and CBIAC have been used by special task customers to assist in the development of long term research and development plans. The Smart Munitions Program Office has used GACIAC extensively in support of the Office and the Joint Committee on Guidance and Control to identify strengths, weaknesses, and gaps in the Smart Munitions RDT&E program. The Naval Sea Systems Command has made extensive use of CBIAC to identify strengths and deficiencies in the Navy's NBC research program.

(d) Standards and Standardization

GACIAC has produced several models of precision guidance munition performance which are being used by contractors throughout the community to design, develop, and make preliminary judgments about the effectiveness of specific designs against specified target types. Due to the publication of this model, GACIAC has given the precision guided munitions community a nominal or *de facto* standard against which competing designs can be examined. Several different special task users including staff of the Naval Weapons Center, the Smart Munitions Program Office, the Army's Vulnerability Assessment Laboratory, and the Army's Test and Evaluation.

E. OTHER USERS AND OTHER BENEFITS

1. Users in DoD Programs

In the case of GACIAC, the R&AT staff member responsible for tactical weapons guidance and control issues is an active participant on the Joint Steering Committee on Guidance and Control. In this capacity, he has the ability to utilize the resources of GACIAC to assist him in the review and formulation of the R&AT program in this important area of military technology. Although at the time of our review the R&AT staff member is relatively new, he has been willing and able to utilize the Director of GACIAC as an important program adviser.

2. Other Users Beyond the Identified Specific IAC Communities

GACIAC has been very active in inter-IAC discussions and programs. It has worked with the Survivability/Vulnerability Information Analysis Center (SURVIAC) and the Infrared Information Agency (IRIA) to share data, information and reports where the interests of these IACs intersect. Based on a review of orders for GACIAC documents, it seems likely that military service academy and training facilities are using GACIAC reports as primary or secondary instructional materials.

F. SUMMARY

In this chapter we have presented data gathered on the question of quantitative and qualitative benefits to DoD provided by the Tactical Weapons Guidance and Control Information Analysis Center. We found relatively few quantifiable benefits from the core program users with whom we spoke. We did find a large number of core users who were able to categorize qualitative benefits to their work as a result of GACIAC-furnished information. Table 5-13 summarizes the number of users who were able to report qualitative benefits.

Table 5-13. GACIAC Core information Products and Services*

Qualitative Benefit	# of Tasks Reporting Benefit
No Defined Qualitative Benefit	36
Verification/Substantiation	3
Objectivity & Neutral Competence	1
Enhanced Productivity	11
Standards and Standardization	0
Enhanced Communication	11
Enhanced Competitiveness	2
Enhanced Military Capability	3

* The total number of benefit types reported exceeds sample size due to multiple benefit types for several tasks.

We were also able to identify and document several instances in which GACIAC special tasks yielded quantitative benefits to their users. Table 5-14 reiterates data presented in Table 5-9.

Table 5-14. Quantitative Benefits From Selected DOD IACs

IAC	# of Tasks with Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
GACIAC	14	\$5,286,000	\$5,045,000	LOWER LABOR RATES REDUCTION IN FIELD TEST TIME ACCELERATION OF R&D
	5	\$1,642,000		

In addition to these quantitative benefits, several GACIAC special tasks provided DoD users with specific qualitative benefits summarized in Table 5-15.

Table 5-15. Qualitative Benefits of Selected GACIAC Special Tasks

IAC	QUALITATIVE BENEFIT	EXAMPLE
GACIAC	IMPROVED CAPABILITY	AEGIS ECCM/ESM PROGRAM STINGER MODEL
	IMPROVED TESTING	E-O MODELING/COUNTERMEASURES AEGIS TESTING/ASM TESTING
		ARMY ANTI-AIR TESTING
	IMPROVED R&D PLANNING	ADVANCED AF MATERIALS TESTING
	MATERIALS FOR SENSORS	SAM/AAW SYSTEMS TESTING NEW SENSOR MATERIALS FOR AF MATERIALS LABORATORY
	ACCELERATED R&D	IMPROVED ANTI-ARMOR TEST PROGRAM

While it is difficult to calculate a benefit-cost ratio for GACIAC as a whole, we found that in those instances where special task benefits could be calculated, the benefits exceeded the costs by a factor of a little better than 3. The apparent benefit/cost ratio of 3 to 1 for GACIAC special tasks is consistent with earlier calculations for CBIAC.

6. BENEFITS FROM RAC

A. INTRODUCTION

The Reliability Analysis Center (RAC), operated by the IIT Research Institute under contract to the U.S. Air Force's Rome Air Development Center, is the repository for information and analytical techniques dealing with issues of reliability. The primary focus of RAC has been electronics reliability. In recent years, it has expanded its focus to address issues of mechanical reliability as well.

RAC has been a pioneer in the development of statistical process control techniques to improve the reliability of electronic and other systems used by the Department of Defense. In addition to maintaining large data bases on electronic component reliability statistics, RAC also maintains an extensive collection of documents, journals, and serial publications dealing with this subject.

The following table summarizes RAC Funding for the period FY 1985 through FY 1989. This table helps to put into perspective RAC's core and special task programs.

Table 6-1. RAC Funding FY 1986-FY 1989

Fiscal Year	DLA Core Funding	Additional Funding by Services	Special Tasks	Product Sales	TOTAL
1985	\$640,000	\$10,800	\$3,042,069	\$265,811	\$3,958,680
1986	\$480,000	0	\$3,405,278	\$626,583	\$4,511,861
1987	\$454,000	0	\$2,099,785	\$508,033	\$3,061,818
1988	\$425,000	\$285,771	\$2,800,988	\$489,343	\$4,001,102
1989	\$443,000	\$149,962	\$4,010,612	\$513,055	\$5,116,629

RAC has enjoyed a relatively stable base of DLA support following the substantial reduction in core program in FY 1986. It has successfully developed alternative products and services for which there is a demonstrated market. In particular, RAC has pioneered the use of proprietary training courses as a means of generating funds to sustain core

information collection and analysis. This stability in external funding resulting from product sales has enabled RAC to sustain the analysts central to the core program even in the absence of stable core funding.

As in the case of CBIAC and GACIAC, the funds provided by DLA and the military services under the category, additional service funding, support a small nucleus of the RAC staff. Funds generated by external sales and special studies provide the bulk of the financial resources used to support RAC staff.

B. CORE PROGRAM DESCRIPTION

The core information and analysis program offered by RAC is quite broad. In addition to offering technical inquiry and bibliography services, RAC maintains a vigorous current awareness program for its users. Included in this current awareness program are a newsletter, selected dissemination of information produced by RAC, and dissemination of its own reports. RAC has pioneered the development of training courses as an IAC information services.

We identified a wide range of IAC products and services provided during FY 1988 for which users might be identified and interviewed to obtain their insights into the benefits and costs of the IAC's core program. As in the case of CBIAC and GACIAC, two categories of core products were identified. The first group consists of general distribution products including:

- Newsletters
- State-of-the-Art Reports
- Critical Reviews and/or Technology Assessments
- Conferences and Conference Proceedings
- Handbooks and Data Books.

These are produced on a more-or-less regular schedule, depending to a large degree on the availability of core funding. Table 6-2 provides a brief listing of core products produced by RAC during the period 1984-1988.

We did not review the distribution list for the newsletters, but did obtain a copy of surveys of newsletter readers to review mechanisms for obtaining user feedback and to obtain comments on newsletter use.

Table 6-2. RAC Core Products, 1984-1988

Discrete Semiconductor Device Reliability (DRS-4)
Electronic Equipment Maintainability Data (EEMD-1)
Electronic Equipment Reliability Data (EERD-2)
Electrostatic Discharge Symposium Proceeding, 1984 (EOS-6)
Electrostatic Discharge Symposium Proceeding, 1985 (EOS-7)
Electrostatic Discharge Symposium Proceeding (1986) (EOS-8)
(Floppy) Microcircuit Reliability Program (FMRAP)
Electronic Equipment Reliability Data (EERD-23)
Linear Interface Data (MDR-20)
Microcircuit Device Reliability Trade Analysis (MDR-21)
Microcircuit Device Reliability Field Experience Database (MDR-21A)
Microcircuit Device Reliability Databooks (set of the 2 above) (MDR-21S)
Microcircuit Screening Analysis (MDR-22)
Microcircuit Screening Data (MDR-22A)
Microcircuit Screening Set (MDR-22SET)
Microelectronic Failure Analysis Techniques (MFAT-1)
(Hardcopy) Microcircuit Reliability Program (MRAP)
Nonoperating Reliability Databook (NONOP-1)
Nonelectronic Parts Reliability Data (NPRD-3)
Analysis Techniques for Mechanical Reliability (NPS-1)
Primer for Reliability, Maintainability, and Safety Standards (PRIM-1)
Nonoperating Reliability Prediction System (RAC-NRPS)
Reliability Design Handbook (RDH-376)
Practical Statistical Analysis for the Reliability Engineer (SOAR-2)
Integrated Circuit Quality Grades: Impact on System Reliability and Life Cycle Costs (SOAR-3)
Confidence Bounds for System Reliability (SOAR-4)
Surface Mount Technology: A Reliability Review (SOAR-5)
ESD Control in the Manufacturing Environment (SOAR-6)
Microcircuit Screening Effectiveness (TRS-1)
IRPS Proceedings, 1968-1978 (TRS-2)
IRPS Proceedings, 1979-1984 (TRS-2A)
EOS/ESD Technology Abstracts, 1982 (TRS-3A)
EOS/ESD Proceedings, 1979-1984 (TRS-4)
ISTFA Proceedings, 1978-1985 (TRS-5)
Electrostatic Discharge Susceptibility of Electronic Devices (VZAP-1)

Like other IACs, RAC also provides core services on an individual response basis. Among the services provided in this category are the following:

- Bibliographic Searches
- General Information Responses
- Technical Inquiry Responses
- Papers, Manuscripts, Document Requests
- Referrals to Experts, Other Information Resources.

RAC provides many of its services to individual, corporate, or government users who pay a fixed fee for a range of services. The following discussion assesses the benefits of these services to users extracted from RAC's user data base.

C. BENEFITS FROM CORE PROGRAM

1. Types of Core Products and Services

RAC provided IDA with a complete listing of 92 individual response core services for the period, December, 1984-September, 1988. These lists were used to develop a sample of core product and service users on which to conduct a survey of benefits and costs of IAC core products and services. Table 6-3 summarizes the types of services or information provided on an individual response basis by RAC.

**Table 6-3. RAC Core Individual Response Users CY 1988--
Classification by Organization Type**

Department of Defense	
Army	2
Other U.S. Government	2
DoD Contractor	50
Commercial Entities	7
Academic/Professional	2
Foreign	
NATO	14
Non-Nato	17
RAC Core Individual Response Population	92

Based on the lists of core product and services and their consumers provided by RAC, we undertook a comprehensive telephone survey to identify the benefits users obtained from their use of these RAC. Table 6-4 summarizes the kinds of information and products and services provided to users we were able to contact to assess benefits provided by RAC.

**Table 6-4. RAC Individual Response Core Services
Provided by Service Type**

Documents	22
Technical Inquiries	10
Training	1
RAC Core Individual Response	26
(Sample is based on RAC subscription users only)	

The results of our assessment of RAC core program benefits are described below.

2. Benefits of General Distribution Products

IDA did not systematically evaluate general distribution products including newsletters, state-of-the-art reports, critical reviews, etc., during this phase of our study. We found in the case of RAC, like the cases of CBIAC and GACIAC, that although such core program information products frequently are sent to individual addressees, it was difficult to determine who the ultimate users of these products really are.

During our review of special tasks, we did meet with several IAC users who volunteered information on the benefits of selected RAC core products which they had received in the past. For example, staff at the Naval Avionics Center in Indianapolis, IN, have used the RAC handbooks and state-of-the-art reports as teaching tools. These documents were deemed especially valuable in introducing young engineers with a good grounding in principles of electronics and electronics reliability to the special problems of military electronics reliability.

Staff at the Marine Corps Logistics Center in Albany, GA, used RAC handbooks and conference proceedings as part of their on-the-job training in military reliability issues. The special task user at the Federal Aviation Administration told us that his staff benefited similarly from RAC's general distribution core products.

RAC routinely conducts surveys of its user communities to obtain feedback on its products and services. We reviewed RAC's newsletter survey file and found most of the respondents were generally quite pleased with the newsletter. Most had few substantive comments on its content, however, but were pleased to receive it. Generally, the newsletter is seen as a vehicle for quickly keeping tabs on the reliability community, especially those organizations in the government which are especially concerned about electronics reliability.

3. Benefits of Individual Response Services

In order to better understand the benefits and costs of core products and services to RAC user community, we sought out a sample of individual response products and services to be interviewed by telephone. Our sample focused on those users who received either a bibliography or an answer to a technical inquiry. Our maximum sample size for RAC is summarized in Table 6-5.

Table 6-5. Sample Individual Response Items for FY 1988

	Bibliography	Inquiries	Other Core Services
RAC	0	10	23

It must be borne in mind that the entries in Table 6-5 refer to specific products or services provided to named individuals who could be located by corporate address and/or telephone number. One should not infer from this data that RAC provided no bibliographies; rather these items were provided to individuals in DoD for whom no address or telephone number was readily available. Librarians at DoD research facilities were frequently the recipients of such information.

Table 6-6 summarizes the general results of our sample of individual response items for RAC. It should be borne in mind that this sample was generated primarily on the basis of our ability to identify individual users and contact them by telephone. Appendix F provides additional information from each individual response product user included in this report.

**Table 6-6. RAC Core Users Survey Individual Response
Service Users FY 1986-FY 1989**

User Agency	
1	DoD User
22	DoD Contractor
1	Foreign Government
1	Academic/Professional
1	Other U.S. Government
Nature of Task	
22	Documents
10	Technical Inquiries
1	Training
Funding	
1	User Billed \$887.60 for Documents
Amount of Quantified Benefit	
1	task with quantified benefits in excess of \$1,000
Methods Used to Quantify Benefits by Users	
Benefits based on savings if alternative source of documents and information had been used	

These benefits to RAC core are discussed below.

(a) Quantitative Benefits

RAC core users who were interviewed for this study were selected from a list of 92 subscribers for RAC document services. Of the 92 users, 31 were physically based outside the United States and as such were not contacted at all. Another six individuals were no longer employed at the address provided by RAC. Of the remaining 55 core users of RAC, we successfully interviewed 29 individuals. Of that sample, only one quantified a benefit from the services he had received from RAC.

The one core user able to quantify the benefit of his use of RAC had sought independent verification of maintenance and reliability data from RAC. This user had conducted an investigation for his client which suggested that certain redundant systems ought to have routine maintenance. He had generated his own data to substantiate the claim; however, the customer required an objective third party to prove or disprove the claim. He was aware of an alternative source of information (the Systems Reliability Service in the United Kingdom). He estimated that the cost of getting the information from

them would be at least \$1,000. He also stated that it would require a trip to the United Kingdom of at least one month with the attendant (and nontrivial) travel costs. In addition, he added, if he needed to clarify an issue with RAC, it was a matter of making a simple telephone call, a luxury he would not have with the alternative source.

Six others reported benefits from RAC that might have been quantified but were not. By and large, the benefits were savings associated with not having to generate and maintain electronics reliability data in-house. Of the six RAC core users, five mentioned that they saved money by not having to perform expensive laboratory tests, especially in the area of failure rate analysis. They also saved large amounts of time associated with the collection of comparable data on electronic component reliability. One individual pointed out that some data would take at least two years to derive.

One individual stated that his company uses the data provided by RAC to determine warranties. The data was particularly valuable in framing responses to solicitations requiring failure rates and warranty periods. This satisfied RAC core user further reported that in the absence of RAC data, he would not even bother to collect data or design warranties for his firm's products. Given recent statutory requirements for warranties on weapon systems, in the absence of RAC electronic reliability data, this user's firm would probably withdraw from direct participation in the DoD industrial base.

Another RAC core user who is involved in the manufacture of radar components for submarines told us that if RAC did not exist, the cost of collecting and analyzing electronic component reliability data himself would be prohibitive. Absent RAC, this manufacturer's representative reported that his firm would either seek a waiver from the contractual requirements for radar failure rate data or withdraw from direct participation in the DoD industrial base. The government's options under this set of circumstances would be quite limited: it could fund separately the collection and analysis of failure rate data or deal with the uncertainty of not knowing the rate of failures of submarine-borne radar equipment in an operational environment.

In summary, RAC users reported several instances of benefits which could be quantified. One user was able to quantify a \$1,000 savings because he did not have to go to an alternative source. Six reported unquantified benefits derived from not having to perform expensive laboratory tests and maintain data collections over long periods of time.

(b) Qualitative Benefits

All the RAC users interviewed were recipients of documents.

The benefits cited by users included the following classes:

- Verification of information;
- Objectivity and/or neutral competence
- Enhanced productivity;
- The ability to work to standards (in some cases, the standards the IAC helped to produce);
- Enhanced communication; and
- Greater competition; and
- Improved military capability.

Core users of RAC interviewed for this study were able to provide examples of each type of benefit. For further discussion see Appendix F.

(i) Verification/Substantiation

In the survey, four RAC users reported that the IAC they had used had provided significant benefit by verifying or substantiating data obtained from other sources. In some cases, independent verification had a quantifiable benefit (e.g., the RAC customer who saved \$1,000 by not having to go to an alternate source). Typically, however, users did not ascribe that kind of savings to verification. In the case of RAC users, substantiation usually took the form of verifying reliability and failure rate predictions.

(ii) Objectivity and Neutral Competence

Objectivity has several facets from the perspective of the IACs' user communities. IACs are recognized by their user communities as centers of excellence because of the highly competitive process by which the basic IAC contract is awarded. IACs perform collection and analysis of scientific and technical information; they do not engage in the manufacture of products for DoD or other U.S. Government agencies. IACs work for OSD and all three military services. The present financial pressures within the IAC program makes it imperative for DoD IACs to serve the broadest possible user base and to refrain from developing too close a working relationship with any single user or military department. IACs therefore combine strength of technical analysis with the absence of long-term financial or institutional interest to present to their respective user communities a "neutral competent" institution which can assist users in the design, development, implementation, and adjudication of standards and specifications.

Objectivity was another important benefit for users included in our current study. Two RAC users, two GACIAC, and six CBIAC users reported going to the IACs because they were objective. One user reported, particularly in the case of state-of-the-art reviews, GACIAC's objectivity was critical since it had no particular institutional or programmatic prejudice.

(iii) Enhanced Productivity

Five RAC users reported savings based on avoiding a need to perform expensive laboratory tests. These IAC users saved time and resources by not conducting tests which would have unnecessarily duplicated existing data and information. They were able to use their personnel, laboratory, materiel, and financial resources for more productive purposes.

Four RAC users reported increased productivity or enhanced efficiency. The specific qualities of improved productivity or enhanced efficiency cited were shortened learning time, improved quality assurance/quality control, and improved labor productivity.

Three RAC users reported using information provided by IACs to justify and make design changes.

(iv) Standards and Standardization

Working in conjunction with the U.S. Air Force Rome Air Development Center, RAC is a major custodian of several Military Standards (MIL-STDs) related to military electronic components and equipment reliability. Several of the RAC users mentioned RAC's participation in establishing Air Force reliability standards as a reason for their confidence in RAC. Customers view RAC as the authoritative DoD voice in electronics reliability standards.

(v) Enhanced Communication

The basic DoD directive covering the collection and dissemination of scientific and technical information, DoD Directive 3200.12, establishes a very ambitious program for the communication of such information between DoD components and their contractors. The technical training courses offered by RAC were widely praised by many senior managers who had sent their more junior staff through these courses.

(vi) Enhanced Competitiveness

One small business RAC user reported significant improvements in his firm's ability to compete for DoD contracts because of the information provided by RAC. His firm is involved in logistics analysis and management. It had the capability to evaluate failure rate data and to make reliability/maintainability and failure predictions based on data but no reasonable way of conducting expensive, time consuming experiments to collect electronics reliability data. The ability to obtain such information from RAC enabled his firm to offer technical analysis services to the government. Absent the existence of RAC, his firm would not be able to compete with large businesses. The fact that the data was available for his scientists, engineers, and analysts to use allowed a prime contractor to subcontract business to his firm.

(vii) Improved Military Capability

Three commercial users of RAC identified the IAC as an important source of information bearing on the reliability of military equipment either deployed with U.S. forces or about to enter the inventory. Systems identified by these users included AEGIS, TARTAR, PATRIOT, and torpedoes.

D. BENEFITS FROM SPECIAL TASKS

1. Background

As in the case of CBIAC and GACIAC special task users, our approach to RAC special task users was quite straightforward. We examined the list of special tasks provided by RAC to identify either individual heavy users or geographic concentrations of heavy users. Table 6-7 characterizes the population of special tasks of which we were aware at the beginning of the current phase of our study for each of the IACs.

Table 6-7. Sample IAC Special Task Users by Military Service

Service	PAC Users
Air Force	2
Army	5
Navy/Marines	4
OSD	1
Other USG	1
Total Population	12

We were able to collect data through interviews on 8 RAC tasks.²⁵ Data was collected through hour long interviews followed up from time to time by additional telephone conversations or correspondence. Table 6-8 captures the degree to which our study was able to cover the special tasks undertaken by each IAC.

Table 6-8. Coverage of RAC Special Tasks

	Air Force		Army		Navy	
	Tasks	Dollars	Tasks	Dollars	Tasks	Dollars
RAC	50%	91%	27%	50%	75%	90%

As in the case of CBIAC and GACIAC, we attempted to learn which communities were funding special tasks at RAC based on funding categories. Table 6-9 summarizes the results of our inquiries about funding sources with RAC users.

Table 6-9. Budget Categories of Special Studies Performed by Three DoD IACs

Budget Category	AF	AR	N
Unknown	1	2	
6.1			
6.2			
6.3A			1
6.3B			1
6.4			2
O&M			1
Procurement	1	1	1

This table treats each occurrence of a budget category as a discrete source of funds even though there are several instances in which funds from multiple budget categories are used to support one task. Unlike CBIAC and GACIAC, RAC appears to be providing significant support to the O&M and Procurement community. This is not especially

²⁵ For purposes of simplifying travel planning and analysis of data, we have treated multiphase special tasks conducted for the same requiring activity as one task even though the IACs will report each phase as a separate task. As a result, we understate by a small margin the number of tasks actually reviewed for each IAC covered in this report in comparison with the number of tasks reported by the IAC Program Office at DTIC.

surprising given the relatively late stage in the acquisition process when issues of reliability and maintainability receive significant attention by the services and their contractors.

2. Summary Results

We found only 3 RAC special task users able to present evidence of a quantified benefit measured in dollars. The results shown in Table 6-10 again illustrate that at least in aggregate, the benefits outweigh the contract costs for those special tasks where quantitative benefits could be identified and substantiated. The data underlying this table will be discussed in greater detail below.

Table 6-10. Quantitative Benefits From Selected DOD IACs

IAC	# of Tasks with Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
RAC		8	\$1,916,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • COST AVOIDANCE BY AVOIDING OF AMMO PLANT • IMPROVED RELIABILITY OF MILSTAR SYSTEMS
	3	\$1,225,500	>\$15,330,000	

We also found several RAC special task users who described the results of RAC special tasks in terms that lead us to believe at some future point in time it will be possible to quantify the benefits of the IAC work; it is not possible to do so at this time. Finally, we found several IAC users who told us of benefits that had been received from the work performed by an IAC which were important to their programs but could not now be quantified nor was it ever likely that such benefits would be quantifiable.

Table 6-11 summarizes the results of our efforts to categorize the benefits reported by RAC in terms of quantified, quantifiable, defined and undefined benefits. As the table makes clear, most special task users with whom we spoke were able to define the benefits of IAC special tasks for their research and engineering programs; they were frequently able to define the benefits of special tasks in terms that might permit quantification of benefit in terms of dollars saved or hours saved at some future point in time. Several users reported benefits that might at some future point be reported in terms of improved performance of military personnel as measured by standard training techniques. However, unlike the pilot

study of NTIAC, we report only one instance of quantifiable benefits obtained for each IAC included in this phase of our study.

Table 6-11. Benefit Categories Reported by Special Task Users of GACIAC, CBIAC, and RAC

Benefit Type	RAC USERS
Not Known	
Quantified	3
Quantifiable but no data available	3
Defined but not quantifiable	4
Not Defined	

A more detailed discussion of both the quantitative and qualitative benefits attributed to RAC by its special task users follows.

3. Quantitative Benefits Assessment

Table 6-12 summarizes special tasks performed by the Reliability Analysis Center for DoD components. A total of 15 special tasks have been undertaken by RAC during the period 1985-1988. IDA was able to obtain information regarding the benefits of 8 special tasks. Three special tasks with a total cost of approximately \$1,225,000 yielded results measuring in excess of \$15,000,000 over a four year period,

Picatinny Arsenal has operated a large program over the past four years oriented towards the design of Army Ammunition Plants which can be built, tested, and then mothballed for a long period of time until needed in a national emergency requiring them to reach optimum output in a very short period of time. A team consisting of RAC, DACS, ARDEC, and Rock Island Arsenal spent a total of \$7.3 million on the Production Readiness Enhancement Program. As a result of this program, the Army estimates that it will avoid more than a billion dollars in expenses associated with 21 new ammunition plants as follows per plant:

- \$20-30 million in new ammunition plant construction;
- \$25 million in future pollution abatement costs;
- \$10 million in start up; some \$20 to \$30 million in new plant construction.

Table 6-11: Quantitative Benefits of RAC Special Tasks

TASK ID	TASK TITLE	USER AGENCY	CONTACT	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
RAC-15	Production Facilities Life-Span Program (PSP)	US Army ATRC (AMSC) P&M G Pennyworth Arsenal Conroe TX 37801-5001	Monroe, Doug (201) 724-4231 and Mike Williams (201) 724-3735	\$702,500.00	Design of Process Control for a production plant that will run Army Ammunition Plants each costing for a few millions per year and then be replaced for a prolonged, unknown period. It will be required to be a full capacity in a very short period of time. PMA RAC \$20.3M, ARDEC \$300M PMA RAC \$50M, Rock Island \$5.5M Total RAC 702M at \$7.3M	State design procedures to be used at 21 Army Ammunition Plants each costing over \$100,000,000 for construction, construction, installation, and reopening. Improved training for operating staff as part of the test of life away and react procedures. Total savings in the hundreds of millions of dollars range back to several production plants @ \$100 million each, and not have to be built. Estimate is that about 10% of the production plant costs are process control related.	> \$8,000,000	Without modeling, new plant design and construction costs \$20 - \$30 million; pollution abatement costs \$25 million; startup costs \$10 million; annual operating costs \$1 million; requirement for 21 plants at > \$50 m each is > \$8.1 billion; 10% savings due to process control improvements would yield benefit of \$100 M. RAC's share approx 8.6 %
RAC-17	Reliability Contracted Maintenance	US Marine Corps, Marine Corps Logistics Base, Camp Box 1, Alhambra CA 91704-5000	Cut Leno (812) 430-0851	\$289,613.00	Design system to collect and analyze maintenance data on the liability of vehicles to support generic reliability contracted maintenance, perform test test on LAV 25 for LAV Training	Improvements in life cycle cost estimates, improvements in C&M management, savings in O&M costs, improved contract performance at lower cost	Savings of at least \$40,000 compared to previous contractor	Savings of 12% of contract costs simply by switching from DOE to RAC (PAC project \$374K; DOE cost \$416K); does not constitute qualitative superiority of RAC; no cost/savings data on results of project yet
RAC-27	Field Installation and SOS Analysis MILSTAR	US Air Force, Space Warfare, Los Angeles, AFB, CA 90038-2860	LT Col Clay (213) 336-4848	\$220,000.00	Develop a program for increasing the reliability and built in test systems for fault detection.	Logistics savings in ground stations through reduced spare parts, reduced down time of an essential operational system. Alternative would have been to use the Prime contractor with less confidence and greater cost (at least 30% in overhead costs alone).	> \$8,000,000	Savings will show up in the production phase which has not yet started. Estimate savings in the range of \$8 - \$10 million per year over the system operating life of 15 years.

If we allocate 10 percent of the total savings of \$1 billion to process control technology and then further allocate the savings among RAC, ARDEC, and Rock Island Arsenal based on their financial participation in the program, it appears that RAC's efforts resulted in a savings to the Army of more than \$9 million.

There were also substantial benefits to the Army reported in this special task that have not yet been quantified which will be discussed below.

The Marine Corps Logistics Center reports RAC was approximately 2.5 to 3 times more cost effective than another contractor in designing, developing, and implementing a reliability centered maintenance concept for new Marine Corps vehicles. The MCLC approached RAC on the basis of its publications because it was dissatisfied with the incumbent contractor. For approximately two-thirds the cost of the incumbent, the RAC supplied superior models, data collection techniques, instruction and training, and analysis of data on vehicle reliability; furthermore, it provided generic models which will be applied in the future to other wheeled-vehicle-based Marine Corps systems. Based on data available prior to the conclusion of the special task, the officer in charge of the program estimated that RAC had provided a benefit of approximately \$420,000 for a programmed cost of \$374,000.

Finally, the Air Force Space Division had tasked the RAC to develop a quality assurance program for use in connection with the production of a communications satellite. As a result of the success of the RAC program, the Air Force program manager estimated that when the system enters production and continues in production for more than 15 years, the total savings would be in the range of \$90-\$150 million. Consistent with previous allocations of quantitative benefits, we estimate the value of RAC's contribution to the program to be only \$6 million, a one-time benefit.

4. Qualitative Benefits Assessment

As in the case of CBIAC and GACIAC, many RAC special task users were unable or only partially able to quantify the benefits they received from using a DoD IAC. On the other hand, these users were able to describe other contributions of the work performed by RAC. Table 6-13 summarizes the qualitative benefits reported by special task users of RAC.

QUALITATIVE BENEFITS FROM RAC SPECIAL TASKS

TASK ID	TASK TITLE	USER AGENCY	CONTACT	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
RAC-03	Statistical Process Control for Selected Pilot Production Aircraft Phase 2	Naval Air Force Center, 6000 East 21st Street, Indianapolis, IN 46218-2189	Coy, Lee (317) 353-7414 with John Ramsey, JR. Kutz and Dick Deutch	\$410,922.00	Design reliability analysis - Analysis of reliability performance potential based on data of existing components of similar design.	Improvements in Naval Air Force reliability; staff shortages at NAC would not have allowed NAC to perform studies and analyses leading to potential savings of very large dollar figures over lifetime of electronic components and subsystems into which these components go; Independence of RAC very important.	Not quantifiable	
RAC-02	Preparation and Production of Technical Manual on NAC R&S Standards Module #4	Naval Air Force Center, 6000 East 21st Street, Indianapolis, IN 46218-2189	Shenck, R. with John Ramsey, JR. Kutz and Dick Deutch (317) 353-7410	\$10,186.00	Prepare documents, conduct training on reliability and maintainability standards applied to Naval Air Force Systems.	Standardization - uniform processes and procedures for design, test, production, operation applied by NAC personnel to NAC contractors for Naval Air Force Equipment; timely completion of projects; responsiveness.	Not quantifiable	
RAC-12	Monitor and Critique of the Hardware FMECA of the ECM Pod	US Air Force, Warner Robins Air Logistics Center, WPAFB, OH 43088-5809	Williams, Dave and Ms. Quarles (812) 626-6602	\$97,250.00	Reliability growth in AEWALD 184 ECM pod; review Reproduct data; perform Failure Mode Analysis.	Improvements in combat capability, longer system life, may permit smaller procurement to achieve same overall level of sorties.	Not yet quantified	Comparison of experience data with prototype to experience data from production systems, adjusted for several changes including but not limited to those suggested by RAC analyses. No data yet; should be possible to better measure benefits when production units enter service.
RAC-15	Production Readiness Enhancement Program (PREP)	US Army ARDEC (AUSCIMA-POM-U) Picatinny Arsenal, Dover NJ 07801-5001	Monick, Doug (201) 724-4221 and Mike Whelan (201) 724-3730	\$702,800.00	Design of Process Controls for a production plant that will run for a few months per year and then be mothballed for a prolonged, unknown period, to be restarted and be required to be a full capacity in a very short period of time. PH: RAC 5003A, ARDEC 5900A, PH: RAC 5003A, Rock Island 55 6M RAC 703A of 57.3M	Basic design/procedure to be used at 21 Army Ammunition Plants each costing over \$100,000,000 for construction, operation, mothballing, and reopening. Improved training for operating staff as part of the test of lay away and restart procedures. Total savings in the hundreds of millions of dollars range because several production plants @ \$100 million each will not have to be built. Estimate is that about 10% of the production plant costs are process control related.	>>\$8,000,000	Without mothballing, new plant design and construction costs \$20 - \$30 million; position statement costs \$25 million; startup costs \$10 million; annual operating costs \$1 million; requirement for 21 plants at >> \$50 m each is >>\$1 billion; 10% savings due to process control improvements would yield benefit of \$100 M. RAC's share approx 9.6 %

QUALITATIVE BENEFITS FROM RAC SPECIAL TASKS

TASK ID	TASK TITLE	USER AGENCY	CONTACT	FUNDING	TASK DESCRIPTION	NATURE OF BENEFIT	AMOUNT OF BENEFIT	METHOD OF CALCULATING BENEFIT
RAC-17	Reliability Centered Maintenance	US Marine Corps, Marine Corps Logistics Base, Code BC41, Albany GA 31704-5000	Cpl. Lewis (812) 438-8851	\$289,813.00	Design system to collect and analyze maintenance data on MAC family of vehicles to support generic reliability centered maintenance, perform field test on LAV 25 for LAV family.	Improvements in life cycle cost estimates; improvements in O&M management; savings in O&M costs; improved contract performance at lower cost.	Savings of at least \$40,000 compared to previous contractor	Savings of 10% of contract costs simply by switching from DOE to RAC (FAC project \$374K; DOE cost \$418K); does not consider qualitative superiority of RAC; no cost/savings data on results of project yet.
RAC-18	RFM Support for Airport Surface Detection Equipment (ASDE-3)	Federal Aviation Administration, Surveillance and Weather Sensors Division, 800 Independence Avenue SW, Washington, DC 20581	Walter, Arnold (202) 267-8432	\$30,000.00	Provide electronic reliability standards for Radar system.	Long term reliability estimates; sustainability; standardization between FAA procurements and US Air Force procurements.	Not quantifiable	
RAC-21	Field Test and AS Analytic MLSTAR	US Air Force, Space Division, Los Angeles, CA 90009-2880	Lt. Col. Chy (213) 338-4846	\$220,000.00	Develop a program for improving the reliability and bed in test systems for test detection.	Logistics savings in ground stations through reduced spare parts, reduced down time of an essential operational system. Alternative would have been to use the Prime contractor with less confidence and greater cost (at least 30% in overhead costs alone).	> \$4,000,000	Savings will show up in the production phase which has not yet started. Estimate savings in the range of \$5 - \$10 million per year over the system operating life of 15 years.
RAC-22	Naval Supply Center Statistical Process Control	US Naval Supply Center, 937 North Harbor Drive, San Diego, CA 92132	Capt. Burch3 (619) 832-1688	\$148,178.00	Develop Statistical Process Control (SPC) procedures for a Supply Center Operation. Provide a training package to be read by an in house training team, and train the training team. Provide statistical support during the initial phase in of the SPC system.	SPC is a part of Total Quality Management (TQM) being implemented in the Navy Supply Center.	Not yet quantified	Too soon to quantify, first training phase just getting underway. "Significant benefit" - Capt. Mattox, Commander NSC, San Diego.

(a) Improved Military Capability

RAC special task users also reported significant improvements in military capability as a result of RAC studies. The Air Force is fielding an ECM/ECCM pod with the assistance of RAC. This system is now entering operational test and evaluation in competition with another system. It is performing as expected, and has achieved design goals for reliability sooner than anticipated. The sponsor attributes the program's success to RAC's assistance. RAC has also instituted a reliability centered maintenance program for the Marine Corps Logistics Base, described above. In addition to yielding a small dollar savings relative to other contractors, the Marine Corps staff with whom we spoke described significant improvements in maintenance. These improvements translate directly into increased capability for the Corps. Finally, the Naval Avionics Center identified several avionics programs which in their view had benefited from RAC's assistance. These avionics programs refurbish or support navigation systems, fire control systems, and flight safety systems for several different types of carrier-based aircraft. From the Naval Avionics Center's perspective, RAC had contributed very directly to the operational capability of the naval aviation community.

(b) Objectivity and Neutral Competence

Our sample of special task users did not include any users who indicated that they had gone to RAC because of its presumed neutrality or lack of institutional interest in the outcome of its analyses. In view of the high marks given to RAC by its core users, it may be that RAC special task users simply assumed RAC had no interest in the outcome of its analyses and therefore failed to report this as a significant benefit.

(c) Enhanced Productivity

No RAC special task user explicitly singled out improved productivity as a significant benefit from going to RAC. On the other hand, the Marine Corps Logistics Center at Albany, GA, told us that RAC was far superior in performance to a contractor who had originally been hired to assist the Center in the development of a reliability centered maintenance program for Marine Corps armored vehicles. The officer with whom we spoke told us that as a result of RAC assistance, he was now getting calls asking when the next vehicle in the Marine Corps' family of light armored vehicles would be included in reliability centered maintenance as opposed to calendar scheduled maintenance programs.

He told us that from his standpoint, the Marine Corps was getting much better support for its O&M dollars using RAC than it had from the previous contractor.

(d) Standards and Standardization

RAC is the custodian of the Air Force's specifications for electronic component reliability. The Federal Aviation Administration's Terminal Area Surveillance Radar program elected to use RAC precisely for this reason. The program manager told us that as a result of using the Air Force standards and specifications for electronic components, he was optimistic about his ability to field a radar system that could be supported for a 25- to 30-year life. Although he told us the Air Force-FAA Memorandum of Understanding on Air Space Surveillance made it likely that he would have used Air Force specifications for radar system components anyway, the success of RAC in supporting the Air Force reliability standards and specifications gave him great comfort.

E. OTHER USERS AND OTHER BENEFITS

1. Users in DoD Programs

In the case of RAC, there is no official point of contact on the R&T staff for electronics reliability. The Rome Air Development Center executes this responsibility for the Air Force which in turn provides a point of coordination for the military departments working through the Joint Logistics Commanders and the Joint Laboratory Technical Directors.

2. Other Users Beyond the Identified Specific IAC Communities

RAC has been able to train a significant number of commercial quality assurance engineers in reliability analysis even though those engineers may not be directly involved in DoD-oriented electronics research, development, engineering, or production.

F. SUMMARY

Our review of benefits provided by RAC confirmed the pattern observed at CBLAC and GACIAC. Although we did not systematically review core products and services available on general distribution, those users we contacted in connection with special tasks or individual response core programs told us that they were well served by RAC information products. Frequently, we were told there were no alternative sources for comparable information.

A large number of the individual response core product users were able to characterize the benefits they received from using RAC information products and services. Table 6-14 summarizes these results.

Table 6-14. RAC Core Information Products and Services*

Qualitative Benefit	# of Tasks Reporting Benefit
No Defined Qualitative Benefit	8
Verification/Substantiation	14
Objectivity & Neutral Competence	3
Enhanced Productivity	9
Standards and Standardization	0
Enhanced Communication	0
Enhanced Competitiveness	3
Enhanced Military Capability	2

* The total number of benefit types reported exceeds sample size due to multiple benefit types for several tasks.

RAC special task users interviewed in this study had similar problems in quantifying the benefit resulting from use of RAC for information analysis and technical assistance. Several interviewees were able to describe and document quantitative benefits resulting from use of RAC. The data in Table 6-15 reiterates data presented in Table 6-10 above.

Table 6-15. Quantitative Benefits From RAC Special Tasks

IAC	# of Tasks with Benefit Data	Total Cost of Benefit Data Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Quantified Benefits Tasks		
RAC		8	\$1,918,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • COST AVOIDANCE BY AVOIDING OF AMMO PLANT • IMPROVED RELIABILITY OF MILSTAR SYSTEMS
	3	\$1,225,500	>\$15,330,000	

RAC special task users were also able to describe qualitative benefits resulting from their use of RAC. A summary of this information is presented below in Table 6-16.

Table 6-16. Quantitative Benefits of Selected IAC Special Tasks

IAC	QUALITATIVE BENEFIT	EXAMPLE
RAC	IMPROVED CAPABILITY	NAVAL AVIONICS AIR FORCE EW POD RELIABILITY CENTERED MAINTENANCE FOR MARINE CORPS VEHICLES
	LONG TERM SUSTAINABILITY	FAA TERMINAL AREA SURVEILLANCE

On the basis of our sample, it appears that RAC is providing to DoD benefits in its special studies program valued approximately 15 times their cost. This special task benefit cost ratio is substantially higher than other IACs examined. As noted earlier, RAC special task users tend to be organizations which are dealing with systems either in advanced development or already fielded. RAC provides information analysis and data which bear on operations and maintenance. As a result, there are tangible costs and calculable savings based on costs that would have been incurred had RAC not provided information which allowed the developer or the operator to change customary and usual practices.

7. SUMMARY AND CONCLUSIONS

A. INTRODUCTION

This report has presented the results of IDA's evaluation of benefits provided to DoD by a representative of DoD Information Analysis Center. IDA examined uses of information provided by the Chemical Warfare/Biological Defense Information Analysis Center (CBIAC) during the period 1987-1988, the Tactical Weapon Guidance and Control Information Analysis Center (GACIAC) during the period 1986-1988, and the Reliability Analysis Center during the period 1986-1988. The study examined information provided under both the core program and special tasks.

The IDA study sought to answer two key questions:

- Do DoD Information Analysis Centers provide benefits to DoD and its contractors?
- If DoD Information Analysis Centers do in fact provide benefits, can improvements in IAC program policy, administration, management, and oversight be made to increase the benefits to DoD and its contractors?

IDA was also asked to quantify, if possible, any benefits to DoD provided by IACs identified in this study. IDA was also asked to report on the benefits in a manner that might lend itself to use in program and budget discussions within the Pentagon and the legislative process.

This report presents the results of our effort to identify and quantify where feasible the benefits to DoD provided by DoD Information Analysis Centers.

B. BENEFITS OF CORE IAC INFORMATION PRODUCTS AND SERVICES

Due to problems of logistics associated with an interview-based field study, IDA elected to narrow the range of IAC users from the entire universe to a more manageable sample. In the case of core program information products and services, we focused on those users who ordered individually prepared information items from CBIAC, GACIAC, and RAC. Such items often took the form of bibliographies, referrals to other sources of

information, data sets, data books, or answers to technical inquiries. We devoted most of our conversations and interviews with recent core users of the three IACS. This simplified our data collection somewhat. It also put us in contact with users who had reasonably fresh memories of the information provided by their utilization of it.

1. Core Product and Service Selection

We examined records of individual responses at CBIAC, GACIAC, and RAC and were able to locate individual names and addresses to survey. Table 7-1 summarizes the total number of core program individual response items examined for potential interviewees.

**Table 7-1. Potential Population of Individual Response
Core Program Information Products and Services**

IAC	# of Products
CBIAC	323
GACIAC	283
RAC	92

Table 7-2 summarizes the number of individual response core information products for each IAC by type of product on which we based our assessment of individual response core information product or services benefits.

**Table 7-2. Sample Individual Response Items
Identified by Three IACs for FY 1988**

IAC	Bibliography	Inquiries	Other Core Services
CBIAC	23	39	22
GACIAC	9	0	47
RAC	0	10	23

As noted in the body of this report, one cannot infer that GACIAC answered no technical inquiries or RAC provided no bibliographies in 1988. Rather, we were unable to contact any users who had received these products or services.

2. Core Product and Service Quantitative Benefits

On balance, we found that core program users had a great deal of difficulty quantifying the benefits of information provided by CBIAC, GACIAC, and RAC. Eight CBIAC core program information consumers reported that during calendar year 1988 they had saved in excess of \$565,000. This judgment was based on the estimated costs of obtaining information equivalent to that provided by CBIAC by other means (materials testing) or from other sources. One GACIAC user reported a benefit of using GACIAC to prepare a bibliography in terms of man-days saved. This user did not translate the savings in labor hours to savings in dollars. One RAC core user reported saving approximately \$850 by relying on RAC to provide documents which could otherwise be obtained but at higher cost and considerable delay.

3. Core Program Qualitative Benefits

We did find that most core program users could describe in fairly rigorous terms a broad range of qualitative benefits they obtained by turning to DoD IACs. Table 7-3 summarizes the number of times an IAC user identified a qualitative benefit obtained from CBIAC, GACIAC, or RAC. The reader is reminded that several users reported multiple qualitative benefits from their individual response information item.

Table 7-3. Qualitative Benefits of Representative Sample DoD IAC Individual Response Information Items

Benefit Category	CBIAC	GACIAC	RAC
No Defined Qualitative Benefit	11	36	8
Verification/Substantiation	22	3	14
Objectivity & Neutral Competence	9	1	3
Enhanced Productivity	44	11	9
Standards and Standardization	6	0	0
Enhanced Communication	4	11	0
Enhanced Competitiveness	8	2	3
Enhanced Military Capability	7	3	2
Total # of Tasks Examined	75	50	33

At the macro level of analysis, the core users with whom we spoke were generally able to identify a qualitative benefit from relying on one of the DoD IACs included in our representative sample. On further analysis, it appears that the core program at each IAC is in fact accomplishing one of the primary purposes of IAC program as a whole--promoting the exchange and dissemination of scientific and technical information in fields of science and technology in which DoD maintains a significant programmatic thrust.

C. SPECIAL TASK BENEFITS

1. Special Task Selection and Review

Our study also sought to identify both quantitative and qualitative benefits to DoD accruing from the use of CBIAC, GACIAC, and RAC. We examined a listing of special tasks placed at each IAC for the most recent contract fiscal years. We then selected candidate special task users to be interviewed for our study to assess the benefits of DoD IACs. We commenced to interview identified users in as many locations as could be visited within the time and resource constraints of the task. Table 7-4 summarizes the success we enjoyed in reviewing special tasks for each IAC in this study.

Table 7-4. Coverage of Special Tasks by Representative Sample Study

IAC	Air Force		Army		Navy		Total Tasks
	Tasks	\$	Tasks	\$	Tasks	\$	
GACIAC FY 86-88	100 %	100%	75%	94%	100%	100%	
CBIAC FY 87-88	100%	100%	81%	83%	42%	59%	
RAC FY 86-88	50%	91%	27%	50%	75%	90%	

We were generally very successful in locating special tasks requiring activities and individuals who were at least familiar with the results of the IACs' special tasks if not the originator of such tasks. As a result, we were provided with very good information about the tasks, the results of the tasks, the changes in requiring activity procedures, programs, or policies that resulted from the tasks, and the quantitative and/or qualitative benefits as perceived by the users.

As a sidelight, we were better able to understand the variability among the IACs in their user communities by virtue of funding categories associated with the funds for special tasks. Table 7-5 summarizes the budget categories of funds placed at CBIAC, GACIAC, and RAC in support of special tasks.

Table 7-5. Budget Categories of Special Studies Performed by Three DoD IACs

Budget Category	GACIAC			CBIAC			RAC			TOTAL
	AF	AR	N	AF	AR	N	AF	AR	N	
Unknown		8		3	10	4	1	2		28
6.1					4					4
6.2	4	6	1		11					22
6.3A	4	5		3	10	2			1	25
6.3B			1	1	2				1	5
6.4			2	4					2	8
O&M			1						1	2
Procurement							1	1	1	3

The data suggest, but do not unequivocally prove, that CBIAC, GACIAC and RAC have somewhat different customer bases. GACIAC appears to have much of its strength in the 6.2 and 6.3A development community. CBIAC seems to have considerable strength in the 6.1 and 6.2 advanced research and exploratory development community. RAC seems to have a strong market for its information products and services in the O&M and procurement communities.

In aggregate, however, the data suggest that these three IACs are generally providing the bulk of their support to the R&D community, consistent with the direction provided by the IAC Regulation.

2. Special Task Quantitative Benefits

The study attempted to identify both quantitative and qualitative benefits to DoD resulting from the use of DoD IACs. The choice of DoD IACs as a source of information, analysis, and technical assistance made by special task users suggests an implicit judgment by special task customers that IACs offer at least benefits equal if not greater than the cost of special tasks. Table 7-6 illustrates that in several instances, special task users of

CBIAC, GACIAC and RAC were able to either document or provide information enabling the IDA study team to calculate quantitative benefits for several special tasks.

Table 7-6. Quantitative Benefits From Selected DOD IACS

IAC	# of Tasks with Benefit Data	Total Cost of Tasks	Quantified Value of Benefits	Benefit Calculation Method
	# of Tasks Quantified Benefits	Cost of Tasks with Quantified Benefits		
CBIAC	32	\$4,268,000	\$1,407,500	<ul style="list-style-type: none"> • LOWER LABOR RATES • DEFERRED PROCUREMENT
	5	\$431,000		
GACIAC	14	\$5,286,000	\$5,045,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • REDUCTION IN FIELD TEST TIME • ACCELERATION OF R&D
	5	\$1,642,000		
RAC	8	\$1,516,000	>\$15,330,000	<ul style="list-style-type: none"> • LOWER LABOR RATES • COST AVOIDANCE BY AVOIDING OF AMMO PLANT • IMPROVED RELIABILITY OF MILSTAR SYSTEMS
	3	\$1,225,500		

We found that many special task users of CBIAC, GACIAC, or RAC had great difficulty in quantifying the benefits resulting from their use of the IACs. When users were able to present their quantification of benefits or sufficient data to allow us to quantify the benefits, we saw considerable benefits. In the case of CBIAC, most of the quantifiable benefits were the result of lower labor rates or cost avoidance as a result of a specific special task. In the case of GACIAC, the IAC had developed several analytical tools and techniques which will result in recurring savings to the user community. The development of a terrain model of the Pacific Missile Test Center and its subsequent use in test mission planning, range instrumentation modernization, and test operations will result in recurring savings estimated by the Navy at several million \$ per year.

In the case of RAC, three tasks resulted in benefits which would be measured quantitatively. RAC's contribution to the Army's ammunition plant modernization program was very dramatic. The Army officials with whom we spoke credited RAC with development and implementation of the process control technology at new Army

ammunition plants which obviated the need for \$2.1 billion in new construction. While the Army credited RAC with savings in excess of \$200 million, IDA partitioned the savings among all contractors and Army organizations participating in the ammunition plant modernization program. RAC's share of the \$200 million plus benefit was calculated by IDA at approximately \$9 million. Similarly, the program manager for the MILSTAR program credited RAC with saving the program \$6 to \$10 million per year over the life of the program once the satellites are in production. IDA elected to credit RAC with a one-time savings of \$6 million.

While it is not possible to develop a general benefit-cost ratio for all IAC special tasks, we found that where it was possible to calculate both direct contract or task costs for special tasks on the one hand and quantify benefits on the other, the benefit-cost ratio for the three IACs examined in this portion of our study was as follows:

CBIAC	3.3 to 1
GACIAC	3.1 to 1
RAC	12.5 to 1

3. Special Task Qualitative Benefits

Although many special task users could not quantify the benefits of using CBIAC, GACIAC, or RAC, most could identify discrete qualitative benefits which in their mind equaled or exceeded the costs of their special tasks. Table 7-7 summarizes the qualitative benefits reported to the IDA study team.

Each IAC included in this phase of our study had at least one special task user who could identify a change in the operation of existing military forces which improved U.S. combat capability. We were surprised to see R&D-funded efforts contributing directly to improved operational capability with no additional investment of procurement or O&M funds. CBIAC and GACIAC were also credited by several special task users as playing significant roles in the improvement of military training. CBIAC and GACIAC were credited with improving R&D, especially as a result of the sponsorship of classified meetings. These meetings provide a forum in which data can be collected, analyzed, shared, and ultimately reduced to proceedings which then become the basis for further study and analysis. CBIAC and GACIAC users felt that such meetings were essential to the enhanced flow of scientific and technical information and the acceleration of R&D throughout the communities served by these IACs.

Table 7-7. Qualitative Benefits of Selected IAC Special Tasks

IAC	QUALITATIVE BENEFIT	EXAMPLE
CBIAC	<p>IMPROVED CAPABILITY</p> <p>IMPROVED TRAINING</p> <p>IMPROVED R&D PLANNING</p> <p>IMPROVED TESTING</p> <p>NEUTRAL COMPETENCE</p>	<ul style="list-style-type: none"> • AIR BASE DEFENSE • AIR BASE OPERABILITY • ARMY CW DETECTORS • TANK CREW PROTECTION • NAVY CW TRAINING • AIR FORCE MASK TRAINING • NAVY CW/BW 6.2 PROGRAM • ARMY CHEMICAL DEMIL PROGRAM • CHEMICAL WARFARE STUDIES • BIOLOGICAL DETECTION • SMOKE AND OBSCURANTS PROGRAM • AIR FORCE MASK PROGRAM • EDGEWOOD A&E REVIEWS • BIOLOGICAL DEFENSE PROGRAM ENVIRONMENTAL IMPACT STATE- MENT PROCESS
GACIAC	<p>IMPROVED CAPABILITY</p> <p>IMPROVED TESTING</p> <p>IMPROVED R&D PLANNING</p> <p>MATERIALS FOR SENSORS</p> <p>ACCELERATED R&D</p>	<ul style="list-style-type: none"> • AEGIS ECCM/ESM PROGRAM • STINGER MODEL • E-O MODELING/COUNTERMEASURES • AEGIS TESTING/ASM TESTING • ARMY ANTI-AIR TESTING • ADVANCED AF MATERIALS TESTING • SAM/AAW SYSTEMS TESTING • NEW SENSOR MATERIALS FOR AF MATERIALS LABORATORY • IMPROVED ANTI-ARMOR TEST PROGRAM
RAC	<p>IMPROVED CAPABILITY</p> <p>LONG TERM SUSTAINABILITY</p>	<ul style="list-style-type: none"> • NAVAL AVIONICS • AIR FORCE EW POD • RELIABILITY CENTERED MAINTENANCE FOR MARINE CORPS VEHICLES • FAA TERMINAL AREA SURVEILLANCE

D. SUMMARY AND CONCLUSIONS

We therefore conclude this phase of our study with the finding that core and special task users of CBIAC, GACIAC, and RAC are obtaining a wide range of benefits from the use of the IAC. In each IAC's case, the quantitative benefits derived from core use are relatively small; however, the quantitative benefits from special task use of the IACs are quite substantial.

We also found that the qualitative benefits from both core and special task use of CBIAC, GACIAC, and RAC are quite significant. Each IAC has contributed to improved operational capability of existing military forces; each has contributed to improvements in the training of U.S. military personnel; all have been credited with improvements in R&D productivity.

Having concluded that DoD is benefiting from the Information Analysis Centers Program in its configuration circa 1987-1989, our study turned to an examination of program administration, management, and oversight. These topics are addressed in another IDA Paper available to U.S. Government personnel and authorized contractors entitled, *Evaluation of DoD Information Analysis Centers Program: Representative Sample Study; IAC Program Implementation*.

APPENDIX A:

**DOD REGULATION 3200.12-R-2
CENTERS FOR ANALYSIS OF
SCIENTIFIC AND TECHNICAL INFORMATION**



DEPARTMENT OF DEFENSE

**CENTERS FOR
ANALYSIS OF SCIENTIFIC
AND
TECHNICAL INFORMATION
REGULATION**

JANUARY 1985

**OFFICE OF THE UNDER SECRETARY OF DEFENSE
FOR RESEARCH AND ENGINEERING**

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17 JAN 1985

FOREWORD

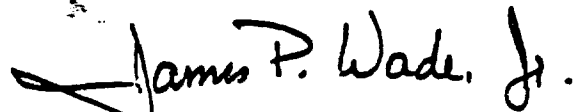
This Regulation is issued under the authority of DoD Directive 3200.12, "Defense Scientific and Technical Information Program," February 15, 1983. It replaces and cancels DoD Instruction 5100.45, "Centers for Analysis of Scientific and Technical Information," July 28, 1964. This Regulation applies to only those centers whose primary purpose is to provide analytical and evaluative support to defense research, development, and acquisition programs and whose basic operating funds are appropriated for research, development, test, and evaluation.

The provisions of this Regulation apply to the Office of the Secretary of Defense, the Military Departments, and the Defense Agencies (hereafter referred to as "DoD Components"). This Regulation prescribes procedures to be followed by all DoD Components in establishing, operating, and administering centers for Analysis of Scientific and Technical Information (hereinafter referred to as Information Analysis Centers) within the framework of the DoD Scientific and Technical Information Program.

This Regulation is effective immediately and is mandatory for use by all DoD Components. Heads of DoD Components may issue supplementary instructions only when necessary to provide for administration of this Regulation within their respective Components. Send recommended changes to the Regulation through channels to:

Director, Research and Laboratory Management
Office of the Deputy Under Secretary of Defense (Research and
Advanced Technology)
The Pentagon, Room 3E114
Washington, D.C. 20301-3081

DoD Components may obtain copies of this Regulation through their own publication channels. Other Federal agencies and the public may obtain copies from the Director, U.S. Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.



James P. Wade, Jr.
Acting
Under Secretary for
Research and Engineering

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TABLE OF CONTENTS

	<u>PAGE</u>
FOREWORD	A-5
TABLE OF CONTENTS.	A-7
REFERENCES	A-8
DEFINITIONS.	A-9
 CHAPTER 1. THE DoD PROGRAM FOR INFORMATION ANALYSIS CENTERS . . .	 A-11
Section A. Policy	A-11
Section B. Responsibilities	A-12
 CHAPTER 2. ESTABLISHMENT AND DISESTABLISHMENT OF DoD INFORMATION ANALYSIS CENTERS	 A-15
Section A. Establishment of IACs.	A-15
Section B. Disestablishment of IACs	A-16
 CHAPTER 3. OPERATION OF DoD INFORMATION ANALYSIS CENTERS.	 A-17
Section A. Policy	A-17
Section B. Responsibilities	A-18

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REFERENCES

- (a) DoD Regulation 5200.1-R, "Information Security Program Regulation," August 1982
- (b) DoD Regulation 5220.22-R, "Industrial Security Regulation," February 1984
- (c) DoD Directive 3200.12, "DoD Scientific and Technical Information Program," February 15, 1983
- (d) DoD Directive 5200.12, "Policy on the Conduct of Meetings Involving Access to Classified Information," September 24, 1984
- (e) DoD Directive 5230.24, "Distribution Statements on Technical Documents," November 20, 1984
- (f) DoD Directive 5200.21, "Dissemination of DoD Technical Information," September 27, 1979
- (g) DoD Directive 5000.19, "Policies for the Management and Control of Information Requirements," March 12, 1976
- (h) DoD Directive 5000.11, "Data Elements and Data Codes Standardization Program," December 7, 1964

DEFINITIONS

1. Analysis. A qualitative or quantitative information evaluation requiring technical knowledge and judgement.
2. Centers for Analysis of Scientific and Technical Information. A formal organization with a primary mission to acquire, digest, analyze, evaluate, synthesize, store, publish, and provide advisory and other user services concerning available worldwide scientific and technical information and engineering data in a clearly defined, specialized field or subject area of significant DoD interest or concern. Information Analysis Centers (IACs) are distinguished from technical information centers and libraries whose functions primarily are concerned with providing reference or access to the documents themselves rather than the information contained in the documents.
3. Data. Any representation such as characters or analog quantities to which meaning may be assigned. Data may be expressed in digital, graphic, electronic, or symbolic form.
4. Scientific and Technical Information (STI). Communicable knowledge or information resulting from or pertaining to conducting and managing Research, Development, Test and Evaluation (RDT&E) efforts. STI is used by administrators, managers, scientists, and engineers engaged in scientific and technological efforts and is the basic intellectual resource for and result of such effort. Throughout this Regulation the term information shall mean specifically STI and may not be construed to mean scientific and technical intelligence.
5. Sponsoring DoD Component. The DoD agency that provides basic operating funds and administrative direction for a given IAC.
6. Technical Advisory Group. A group of technical experts chosen to advise and monitor the activities of a given IAC.
7. Technical Monitor. The Government technology specialist or project engineer providing continuous technical direction and oversight for the IAC.

CHAPTER 1

THE DoD PROGRAM FOR INFORMATION ANALYSIS CENTERS

A. POLICY

1. In recognition of the important and integral part that information analysis and evaluation activities play in the research and development process, the Department of Defense shall endorse institutionalization of these activities in the form of information analysis centers (IACs) when sufficient requirements or benefits are established.

2. DoD IACs shall be established primarily to support the Department of Defense. They may serve the private sector to the extent practicable within DoD security guidelines and DoD policy regarding the handling of information on military critical technologies. Applicable DoD security guidelines include DoD Regulations 5200.1-R (reference (a)) and 5220.22-R (reference (b)).

3. IACs will not receive, process, or disseminate scientific and technical intelligence.

4. Each IAC shall maintain a staff of technical experts in its field of specialization. The center shall be attached to or have a working relationship with a private sector or DoD organization engaged in technical work related to its mission and may seek assistance from qualified experts employed by that organization.

5. Each IAC shall be administered by a single sponsoring DoD Component to be designated by the Under Secretary of Defense for Research and Engineering (USDR&E) in accordance with DoD Directive 3200.12 (reference (c)).

6. Classified information shall be receipted, controlled, disposed of, and protected from unauthorized disclosure in accordance with the provisions of DoD Regulation 5200.1-R (reference (a)) and DoD Regulation 5220.22R (reference (b)).

7. Publication and release of technical information shall be in accordance with DoD regulations including DoD 5200.1-R (reference (a)). Documents containing classified information shall be issued in accordance with DoD release and security directives contained in reference (a) and (b) after they have been reviewed and approved by responsible technical and security authorities.

8. IACs shall be aware of and shall observe all current export control lists and licensing procedures as established by the Department of State, United States Munitions List; The Department of Commerce, Commodity Control List; and the Department of Energy, Atomic Energy Act. IACs shall ensure that all personnel understand fully these lists and procedures, and centers shall be prepared to act whenever necessary to ensure that these lists and procedures are respected.

9. In the case of contractor operated IACs, the Technical Monitor shall provide technical guidance to the IAC, with the assistance of an ad hoc technical advisory group appointed by the Technical Monitor. In-house IACs

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shall have their activities monitored by an ad hoc technical advisory group recommended by the manager of the IAC and approved by the focal point of the sponsoring DoD Component for the IAC concerned.

10. DoD IACs shall establish mechanisms for cooperation and cross-fertilization of ideas on management philosophy, policy, promotion, operating procedures, and other areas of mutual interest. Meetings of all DoD IAC managers, technical monitors, and sponsors shall be held for the purpose of information exchange in these areas.

B. RESPONSIBILITIES

1. The Under Secretary of Defense for Research and Engineering (USDR&E) shall:

a. Maintain overall management control of the DoD STI Program in accordance with DoD Directive 3200.12 (reference (c)).

b. Approve or disapprove all proposals by the heads of DoD Components involving the establishment of new IACs, major changes in an IAC's scope or subject area, or disestablishment of an IAC.

c. Appoint a technology specialist to each DoD IAC as Technical Monitor.

2. The Director, Research and Laboratory Management OUSDR&E (Research and Advanced Technology (R&AT)) or his designee shall:

a. Centrally monitor the DoD IAC program and establish mechanisms to promote standardization among the programs to the DoD Components regarding procurement practices and interagency operations, the development of standard performance measurement, and reporting criteria.

b. Appoint an ad hoc review board to review each IAC at least biennially.

3. The Sponsoring DoD Component shall:

a. Provide continuous administrative and operational management for the IAC assigned. Designated in-house DoD IACs are assigned to the proposing Defense Agency or Military Service as approved by the USDR&E.

b. Prepare and defend programs and budgets consistent with annual budget cycles and USDR&E requirements for each assigned IAC.

c. Establish USDR&E-approved IACs through procurement of contract services or direct in-house establishment, as appropriate.

d. Review performance of the IACs in coordination with the Technical Monitor and the Director, Research and Laboratory Management, OUSDR&E (R&AT) to assess continuing need and approve program changes as necessary to improve performance.

4. The Technical Monitor shall:

- a. Provide continuous technical direction and oversight for the IAC assigned.
- b. Assess technical subject requirements and adequacy of literature coverage by the IAC for the DoD users.
- c. Evaluate and approve IAC proposals for products and services from the technical standpoint.
- d. Be a Government employee and not a member of the IAC staff. Synonymous titles are Technical Manager, Government Project Engineer, and Contracting Officer's Technical Representative (COTR).
- e. Provide the technical requirements input for the Statement of Work for contractor-operated IACs.

CHAPTER 2

ESTABLISHMENT AND DISESTABLISHMENT OF DOD INFORMATION ANALYSIS CENTERS

A. ESTABLISHMENT OF IACs

1. Proposals from DoD Components for establishment of an IAC shall be processed through the same channels that are used to approve and authorize any other RDT&E program.

2. Approval shall be based on, but not limited to, the following criteria:

a. Documented evidence of a requirement to fill a void in an emerging DoD technology thrust area.

b. Clear definition of subject fields to be covered and demonstration that other IACs or sources do not duplicate the proposed IAC.

c. Cost and effectiveness and evaluation of alternate ways of accomplishing the objectives of the IAC.

d. Adequate financial support and plans for continuing support to achieve the announced objectives of the IAC.

e. Active support of the IAC by persons engaged in the type of technical work to be covered by the IAC's information products.

f. Evidence of capability to enforce proper security procedures and controls on technology transfer.

3. Subject Coverage. Subject areas covered by an IAC may be determined from one or both of the following categories:

a. Discipline-Oriented Coverage. This information pertains to all, or a clearly defined part of, a recognized scientific or engineering discipline, which has its own literature or professional traditions.

b. Mission-Oriented Coverage. This information pertains to a military undertaking of special interest to the Department of Defense or to a specific large weapon or its support system or a group of such systems, and therefore, an area that requires an interdisciplinary approach.

4. Size and Location

a. No specific limitations are imposed concerning the size of an IAC as long as the functions described in Definitions (page iv) can be accomplished.

b. IACs may be located at:

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1. DoD installations, laboratories, and activities.
2. Contractor installations (educational institutions, industrial firms, and not-for-profit institutions).
5. Security. IACs will satisfy all physical and document security requirements, as set forth in applicable and referenced DoD directives, for the protection of classified information stored or held therein.

B. DISESTABLISHMENT OF IACs

1. A combination of factors may form the basis for a decision to recommend disestablishment of an IAC. Following a complete review, the USDR&E will make the decision concerning disestablishment of an IAC. The following are typical of questions that may be considered in pondering such a decision.
 - a. Is the IAC still functioning in a major DoD technology thrust area?
 - b. Is the IAC demonstrably useful to the Department of Defense?
 - c. Is the IAC fulfilling a DoD need that is not duplicated by other public, private, or government organizations?
 - d. What is the value of products or services to users with respect to current DoD programs?
 - e. Are funds available?
 - f. Is the IAC maintaining proper security controls and controls over transfer of technology to foreign individuals and organizations?
2. After the USDR&E has decided to disestablish an IAC, the following shall be accomplished:
 - a. The sponsoring DoD Component shall announce a termination date at least 90 days before the termination date and shall require the managing supervisor of the IAC to provide a written inventory of the IAC's holdings.
 - b. The sponsoring department or agency shall decide the disposition of the IAC's holdings with the assistance of the managing supervisor of the IAC and the approval of USDR&E.

CHAPTER 3

OPERATION OF DOD INFORMATION ANALYSIS CENTERS

A. POLICY

1. Basic IAC operations, as defined by the sponsoring DoD Component, shall be supported by DoD funds.

2. IACs shall assist in advancing standardization of the technology in the IAC's special field of expertise.

3. IACs shall make optimal use of cost-effective new and advanced technologies, such as computers, telecommunications, and word processing, in operation of their centers.

4. IACs shall acquire, store, and disseminate subject area technical information from appropriate sources, domestic and foreign, including support of approved information exchange programs with countries that have agreements with the United States. However, IACs will not duplicate the existing DoD foreign open-source scientific and technical intelligence literature exploitation program or automated data base.

5. If applicable, IACs shall participate in programs designed for the transfer of technology in assigned areas of technical responsibility. Equally, they shall ensure that such participation does not lead inadvertently to unauthorized transfer of technology.

6. IAC personnel are authorized and encourage to plan, provide technical support for, and participate in major technical conferences, meetings, or symposia in their area of technical specialization. Sponsorship and attendance at meetings will be in accordance with applicable DoD regulations such as DoD Directive 5200.12 (reference (d)) including provisions on security and on transfer of technology. IAC personnel shall maintain contact with senior investigators and develop working relationships with technical, professional, and trade associations and related technical groups to exchange information. Travel funds shall be conserved by using meetings and conferences as an opportunity for making known the products and services of the IAC and maintaining contact with senior investigators in the specialized field of the IAC.

7. IACs shall prepare, announce, and provide primary distribution of critical reviews, state-of-the-art reports, handbooks, data compilations, lists of technical experts, and other significant publications pertaining to their assigned areas of technical specialization. IACs shall respond to inquiries from qualified users bearing in mind applicable security controls and restrictions on transfer of technology to foreign individuals and organizations.

8. With the exception of scientific and technical intelligence, classified or special category material may be received by an IAC provided that the information is pertinent to the mission of the IAC and appropriate security measures have been established.

9. Primary distribution of documents formally issued by an IAC, other than direct correspondence in response to inquiries and the annual reports of the IACs, will include the Defense Technical Information Center (DTIC).

10. IACs will not provide secondary distribution for any documents other than their own. Any IAC engaged in secondary distribution of DoD generated reports shall transfer the distribution activity to the DTIC.

11. The DTIC will provide microfiche copies of technical reports originated by the IACs to DoD and its contractors registered for services with the DTIC at the standard microfiche price.

12. Services provided by the IACs will be on a cost-recovery basis in accordance with guidelines provided by the sponsoring DoD Component.

B. RESPONSIBILITIES

1. The Sponsoring DoD Components shall:

a. Establish standard reporting requirements and performance measuring criteria for each IAC under its cognizance to the extent possible to permit evaluation of the relative effectiveness of individual IACs.

b. Ensure that the IAC has a clear definition of subject fields to be covered to avoid duplication.

c. Evaluate the cost, effectiveness, and continuing need for assigned IACs.

2. The Technical Monitors shall:

a. Establish operational procedures consistent with DoD security guidelines and technology transfer policy for IAC services to Federal agencies, the private sector, and other customers.

b. Review and correct as necessary IAC publications prior to printing and dissemination.

c. Review, in conjunction with responsible security officials, IAC-originated information and material prior to public release to ensure correct distribution statement marking in accordance with DoD Directive 5230.24 (reference (e)) and to ensure correct public release in accordance with DoD Directive 5200.21 (reference (f)).

3. The IAC shall:

a. Provide services to the DoD departments, agencies, and contractors registered for services with the DTIC.

b. Manage and control information and data elements consistent with the requirements of DoD Directive 5000.19 (reference (g)) and DoD Directive 5000.11 (reference (h)).

c. Report on their activities consistent with the Contract Data Requirements List for contractor-operated IACs and with report requirements of the sponsoring DoD Component for DoD in-house operated IACs. DoD Components of the National Foreign Intelligence Program involved in intelligence collection, processing, analysis, production, and dissemination functions similar to those of IACs are excluded from reporting requirements of this DoD Regulation 3200.12-R-2.

d. Comply with directions and requirements issued by the sponsoring DoD Component and the Technical Monitor.

APPENDIX B:

LIST OF DOD INFORMATION ANALYSIS CENTERS

B-1

APPENDIX B: DOD INFORMATION ANALYSIS CENTERS

The following is a list of Information Analysis Centers operated by or on behalf of the Department of Defense. Those Information Analysis Centers funded and/or overseen by the Defense Technical Information Center are highlighted by italicized printing.

***CHEMICAL WARFARE/CHEMICAL
AND BIOLOGICAL DEFENSE
INFORMATION ANALYSIS
CENTER (CBIAC)***

Francis T. Crimmins, Director
Battelle Edgewood Operation
CBIAC
2113 Emmorton Park Road, Suite 200
Edgewood, MD 21040
(301) 676-9030/0200
FAX: (301) 676-9703

***COASTAL ENGINEERING
INFORMATION ANALYSIS
CENTER (CEIAC)***

Dr. Fred E. Camfield, Director
U.S. Army Engineer Waterways
Experiment Station
ATTN: CEWES/CW-D
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-2012
FAX: (601) 634-2055

***CHEMICAL PROPULSION
INFORMATION AGENCY (CPIA)***

Thomas W. Christian, Director
The Johns Hopkins University
Applied Physics Laboratory
Chemical Propulsion Information Agency
Johns Hopkins Road
Laurel, MD 20723-6099
(301) 953-5850/5851
(301) 992-7300
FAX: (301) 730-4969

***COLD REGIONS SCIENCE AND
TECHNOLOGY INFORMATION
ANALYSIS CENTER (CRSTIAC)***

Nancy Liston, Librarian
U.S. Army Cold Regions Research and
Engineering Laboratory (CRREL)
72 Lyme Road
Hanover, NH 03755-1290
(603) 646-4221
FAX: (603) 646-4278

***CREW SYSTEM ERGONOMICS
INFORMATION ANALYSIS
CENTER (CSERIAC)***

Larry Howell, Director
Dr. Donald Pozella, Chief Scientist
Crew System Ergonomics Information
Analysis Center
AAMRL/HE/CSERIAC
Wright-Patterson AFB, OH 45433-6573
(513) 255-4842
FAX: (513) 255-4823

***DOD CONCRETE TECHNOLOGY
INFORMATION ANALYSIS
CENTER (CTIAC)***

Bryant Mather, Director
U.S. Army Engineer Waterways
Experiment Station
ATTN: CEWES/SV-Z
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-3264
FAX: (601) 634-3242

**DATA AND ANALYSIS CENTER
FOR SOFTWARE (DACS)**

John Spina, Program Manager
Kaman Sciences Corporation
P. O. Box 120
Utica, NY 13503
(315) 336-0937
FAX: (315) 732-3482

**DOD NUCLEAR INFORMATION
AND ANALYSIS CENTER
(DASIAC)**

Donald Moffett, Director
Kaman Sciences Corporation
2560 Huntington Avenue, Suite 500
Alexandria, VA 22303
(703) 960-4774
FAX: (703) 329-7198

**TACTICAL WEAPON GUIDANCE
AND CONTROL INFORMATION
ANALYSIS CENTER (GACIAC)**

Dr. Robert Heaston, Director
IIT Research Institute
10 West 35th Street
Chicago, IL 60616
(312) 567-4519
FAX: (312) 567-4889

**HYDRAULIC ENGINEERING
INFORMATION ANALYSIS
CENTER (HEIAC)**

R.J. Brown, Director
Hydraulics Laboratory
U.S. Army Engineer Waterways
Experiment Station
ATTN: CEWES/HV-Z
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-2608
FAX: (601) 634-2818

**HIGH TEMPERATURE MATERIALS
INFORMATION ANALYSIS
CENTER (HTMIAC)**

Dr. Cho-Yen Ho, Director
HTMIAC/CINDAS
Purdue University
2595 Yeager Road
West Lafayette, IN 47906
(317) 494-9393

FAX: (317) 494-0811

**INFRARED INFORMATION
ANALYSIS CENTER (IRIA)**

Dr. Joseph Accetta, Director
Environmental Research Institute of Michigan
P.O. Box 8618
Ann Arbor, MI 48107
(313) 994-1200, Ext. 2214
FAX: (313) 994-5550

**MANUFACTURING TECHNOLOGY
INFORMATION ANALYSIS
CENTER (MTIAC)**

Robert Walk, Director
Ms. Michal Stevens, Information Specialist
IIT Research Institute
10 West 35th Street
Chicago, IL 60616
(312) 263-7125/609-9486
FAX: (312) 781-6894

**METALS AND CERAMICS
INFORMATION CENTER (MCIC)**

Harold Mindlin, Director
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201-2693
(614) 424-4425
FAX: (614) 424-3818

**METAL MATRIX COMPOSITES
INFORMATION ANALYSIS
CENTER (MMCIAC)**

Mr. William McNamara, Director
Kaman Sciences Corporation
816 State Street
P.O. Box Drawer QQ
Santa Barbara, CA 93102-1479
(805) 963-6452
FAX: (805) 963-8420

**NONDESTRUCTIVE TESTING
INFORMATION ANALYSIS
CENTER (NTIAC)**

Dr. George Matzkanin, Director
Texas Research Institute Austin, Inc
415A Crystal Creek Drive
Austin, TX 78746
(512) 263-2106
FAX: (512) 263-3530

**PLASTICS TECHNICAL
EVALUATION CENTER
(PLASTEC)**

John Nardone, Director
Plastics Technical Evaluation Center
Armament Research Development and
Engineering Center (ARDEC)
Picatinny Arsenal, NJ 07806-5000
(201) 724-4222
FAX: NONE

**PAVEMENTS AND SOIL
TRAFFICABILITY INFORMATION
ANALYSIS CENTER (PSTIAC)**

Gerald W. Turnage, Director
U.S. Army Engineer Waterways Experiment
Station
ATTN: CEWES/GM-L
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-2734
FAX: (601) 634-3068

**RELIABILITY ANALYSIS CENTER
(RAC)**

Steven J. Flint, Technical Director
IIT Research Institute
Rome Air Development Center
RAC
Griffiss AFB, NY 13441-5700
(315) 337-0900
FAX: (315) 337-9932

**SOIL MECHANICS INFORMATION
AND ANALYSIS CENTER (SMIAC)**

Joe L. Gatz, Director
U.S. Army Engineer Waterways
Experiment Station
ATTN: CEWES/GV-Z
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-3376
FAX: (601) 634-3139

**SURVIVABILITY/VULNERABILITY
INFORMATION ANALYSIS
CENTER (SURVIAC)**

John M. Vice, Director
Air Force Wright Research & Development
Center
WRDC/FTVS/SURVIAC
Wright-Patterson AFB, OH 45433-6553
(513) 255-4840
FAX: (513) 255-9673

**TACTICAL TECHNOLOGY CENTER
(TACTEC)**

Larry W. Williams, Director
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201-2693
(614) 424-5047
FAX: (614) 424-5263

APPENDIX C:

QUESTIONNAIRE USED IN IAC EVALUATION STUDY

QUESTIONS FOR IAC TECHNICAL MONITORS AND SPECIAL TASK USERS

I. DOD REGULATION 3200.12-R-2 POLICIES AND PROCEDURES

1. What is the general purpose of the DoD Information Analysis Center Program?
2. What is the relationship between your R&D programs and IAC?
3. Is your IAC functioning in a major "technology thrust area" as defined or described in the DoD Directive?
4. Your IAC is by regulation supposed to collect information from as many sources as possible where relevant to its technical area of expertise. It is also barred by regulation from access to and analysis of scientific and technical intelligence.
 - a. Has this limitation on IAC access to scientific and technical intelligence information interfered with the performance of the IAC mission?
 - b. What problems has the limitation on access to scientific and technical intelligence information created for you in your capacity as a COTR?
 - c. What problems has the limitation on access to scientific and technical intelligence information created for you in your capacity as a DoD Program Manager?

II. BENEFITS OF THE IAC PROGRAM

1. What are the benefits offered by your IAC?
2. Focusing first on operations paid for by *core* funds, what are the benefits (if any) that accrue specifically to the following groups or individuals:
 - a. R&AT?
 - b. You, as COTR?
 - c. You, in your other DoD capacities?
 - d. Other IAC contract administrators?
 - e. DLA?
 - f. DTIC?
 - g. DESC?
 - h. DCAA/ACO?
 - i. Other known users (specify which users)?
 - j. Users currently unknown to your IAC with whom you interact?

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3. How have the following groups or individuals benefited from activities funded as special tasks:
 - a. R&AT?
 - b. You, as COTR?
 - c. You, in your other DoD capacities?
 - d. Other IAC contract managers?
 - DLA?
 - DTIC?
 - DESC?
 - DCAA/ACO?
 - e. Other known users (specify)?
 - f. Users currently unknown to NTLAC?
4. How do you evaluate the benefits of IACs?
 - a. What sorts of scales, or "metrics," do you use to measure direct benefits?
 - b. How do you measure the indirect benefits of IACs?
 - c. Is the process for measuring the direct and indirect benefits of core activities different from that for measuring the direct and indirect benefits of special tasks?
5. Timing in benefit measurement
 - a. When do the benefits of your IAC's use accrue to the user?
 - b. When are the benefits of your IAC's activities measured?
 - c. What impact does the timing of benefit measurement have on the results of the evaluation?

III. IAC STRUCTURE

1. From your perspective, what is the administration and management structure of the DoD IAC Program generally and the administration and management structure for the IAC(s) with which you are most familiar?
3. Can you describe the *COTR's role* in the administration and operation of an IAC?
 - a. What are the COTR's responsibilities in each of the following areas:
 - (1) IAC solicitation?
 - (2) Review of proposals?
 - (3) Award of contracts?
 - (4) Addition of special tasks to contract?
 - (5) Review and evaluation of core products and services by the IAC? By core product users?

- (6) Review and evaluation of special task by the IAC? By special task users?
- (7) Review of IAC performance by administrative chain?
- (8) Review of IAC performance by policy chain?
- 4. What actions do you take to promote use of the IACs within your program? What do you do to promote use by DDDRE/R&AT? Do you think promotion of IAC use by other DoD programs involved in research, development, operational test and evaluation or maintenance is also part of your job?
- 5. What do you do to promote inter-IAC communications?
- 6. Can you describe the function of the *DoD program manager* with respect to the IACs in general and NTIAC in particular?
 - a. Under what conditions does your dual role benefit you?
 - b. Under what conditions does your dual role benefit the IAC?
- 7. What is the function of *DESC* with respect to the IAC?
- 8. What is your working relationship with your contracting officer?
- 9. What is *DTIC*'s interaction/involvement with NTIAC?
- 10. What is the *DCAS*'s interaction/involvement with NTIAC?
- 11. What is the function of *DLA(HQ)* with respect to the IAC?
 - a. Under what circumstances do you communicate directly with *DLA(HQ)*? Would your IAC always inform you of its communications with *DLA(HQ)*?
 - b. How is *DLA(HQ)* involved with [IAC]'s core projects and special tasks?
- 12. What is the function of *DDDR&E/R&AT*?
 - a. Is that office ever in direct communication with your IAC?
 - b. How is *OUSDA(R&AT)* involved with your IAC's core projects and special tasks?
- 13. How much of your working time do you typically spend working on or with your IAC during the course of a month?
 - a. Of the time allotted to IAC activities, how much is generally spent dealing with operational issues? Contract administration issues? And policy issues?
 - b. How much of your time involves dealing with core activities? Special tasks?

IV. COSTS IN THE IAC PROGRAM

- 1. What are the costs of the IAC program?
- 2. What are the burdens on your IAC and on the government imposed by the IAC's interaction with each of the following:

- a. DDDR&E/R&AT?
 - b. DLA(HQ)?
 - c. DTIC?
 - d. DCAS?
 - e. DESC?
3. Can you place a dollar cost on these burdens?
 4. Are there specific burdens or indirect costs imposed on your IAC by DCAS, DESC, or DLA which make your IAC a less attractive source of research, analysis, and assistance to current or potential users than other contractors or government activities?
 5. If you were to perform cost-benefit analysis of the IAC program and were to analyze the costs of the program to each entity involved with the administration, or policy planning for, or operation of the IAC, what would you have to say about the costs of the program to each of the following offices:
 - a. DDDR&E/R&AT?
 - b. DLA(HQ)?
 - c. DTIC?
 - d. DCAS?
 - e. DESC?
 6. What *opportunity costs* are associated with the IAC program? Could funds currently allotted to your IAC be as effectively utilized by others in the R&D/Defense industry community to solve similar problems?
 7. What are the positive and negative impacts of the performance of special tasks for the conduct of core tasks?

V. PROGRAM OPERATIONS

1. How does the *physical location* of an IAC affect the operation of that IAC?
 - a. What are the advantages of collocating an IAC with its COTR? What are the disadvantages?
 - b. What are the advantages of collocating an IAC with its user base? Are there disadvantages? Are the advantages and disadvantages different for core and special tasks?
2. IAC Evaluations
 - a. When, if ever, does each of the following offices conduct program evaluations:
 - COTR
 - DDDR&E/R&AT
 - DLA

DTIC

DCAS

DESC

- b. What steps have you taken to ensure that your IAC undertakes ongoing evaluation of its operations and products?
- c. Describe each type of evaluation. How useful is each to you? To the IAC? To the evaluator?
- 3. Can you briefly describe *DLA's contract administration* of the IAC contract?
- 4. Can you briefly describe the government's *accounting system* for your IAC's expenditures?
 - a. Is the system useful and relevant to you? What function does it serve for you? For DDDR&E/R&AT? For DLA?
 - b. What are the burdens imposed by the accounting system? What is its impact on the user base?

5. Can you inform us how the following individuals or groups facilitate or impede the performance of [IAC]'s studies, analyses, and activities in support of the Defense Department?

Group or individual	Facilitate	Impede
Program Manager		
COTR		
DESC		
ACO		
DTIC		
DLA(HQ)		
OUSD(A)(R&AT)		
Special task users		
Core task users		
Other DoD Agencies (e.g., DTSA)		

VI. RECOMMENDATIONS

1. What changes would you make in each of the following areas:
 - a. IAC goals and objectives?
 - b. Policy guidance with respect to IAC operations?
 - c. Accounting of IAC benefits?
 - d. Management structure?
 - e. Policy guidance
 - f. Accounting procedures?

APPENDIX D:

INDIVIDUAL RESPONSE BENEFITS FROM CBIAC

APPENDIX D
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Document	Battelle, Columbus, OH		0		Asked for document for her boss. Does not know what he did with it.
Bibliographies	Battelle, Edgewood Operations, Edgewood, MD		0		Used in research. If went to the library, would ultimately wind up costing sponsor money for time spent researching information.
Bibliography	Battelle-Dayton Operations, Dayton, OH		0		Used information for an Air Force procurement plan for remote sensors. Intended to use bid for ordering documents. Plan slipped for 9 months, but is now starting up again. (Delayed ordering documents because at time no prospect for business, and document order would be straight overhead charge).
Document	Brunswick Defense, St. Petersburg, FL		0		Saw document mentioned in newsletter, which he requested (couldn't get because NOCON limits). CBIAC provided with general literature. Helpful to have reference material.
Bibliography	CRDEC, Aberdeen Proving Ground, MD		0		Intermediary for scientist.
Property Data	CRDEC, Aberdeen Proving Ground, MD		0		Needed data on mustard simulants and diethylmalonate (DEM). CBIAC provided information on DEM, but unfortunately the sources they used had incorrect data for DEM. (Went to great pains to say CBIAC was not to blame because of poor data). Had to do work in-house (took 2-3 man months, \$15,000 to do) to provide accurate data.

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APPENDIX B
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Property Data	CRREL, Aberdeen Proving Ground, MD		0		Went to CBIAC trying to find data not available through Chemical Abstracts or on-line data sources at base's technical library. Disappointed to find out they had no additional information that library did not have.
Bibliography	CRREL, Aberdeen Proving Ground, MD		0		Sought information on vision cycle. Used for research, now presently stalled, but looks like movement in the area.
Technical Information	Grumman Aircraft Systems, Bethpage, NY		0		Used information in internal report on one type of butyl rubber (product description) provided by CBIAC.
Technical Information	Maritime Research Center, Hartford, CT		0		Asked a particular question on protective clothing. CBIAC had no additional information that was not available from STALOG, Chemical Abstracts, GROLS, or NASA.
Bibliography	NSA Netick R&DE Center, Netick, MD		0		Background information. Took him and ordered appropriate documents from it.
Document	Collective Protection Division, Aberdeen Proving Ground, MD		1	Could perform task	Asked for information about a more obscure document which he needed immediately for a briefing to an Under Secretary of Defense. No one except CBIAC could find it for him. Did not know where else he could have gone to get the information without CBIAC.

APPENDIX B
CRAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Property Data	Data Products, Holliston, CT		1		Information provided starting point for project. Able to develop a plan of approach. Doesn't know where else information would be. If couldn't find information elsewhere, would have had to go to customer to relax requirements and/or have to do work themselves.
Technical Information	Precision Instruments, Davenport, IA		1	Verification	Got material easily from them. Program working on was dropped for lack of funds. Basically CRAC provided confirmation.
Technical Information	Martin Marietta, Orlando, FL		1,2	Confidence in data	Used as background information for LANTIRN project. If went to other sources, couldn't be as confident in the quality and comprehensiveness of data provided.
Bibliographies	Battelle, Columbus, OH		1,2,3	Verification	Used data to support analysis of what he was doing. Has used literature reviews to substantiate points he has been making. Used in decision making projects for substantiation. Without literature review, "wouldn't have a leg to stand on." Saved time by not doing search himself.
Bibliography	Kollmorgen, 347 King St., Northampton, MA	\$250,000	1,2,3		Commander's Decision Aid Trainer (CDEAT) on Company develops electro-optics. Had conflict with Army over whether sights in M-1, -2, and -3 vehicles needed to be coated in the interior for protection. Based on his, engineering change plan (ECP) reduced cost to Army of \$250,000 because do not have to paint the interior of the sights.
Property Data	Weed Instruments, Round Rock, TX		1,2,3	Independent verification	Needed a listing of material resistance to warfare and decoy agents for bid proposal. Because of time criticality, could not get information for himself (estimated about 1 month). Was pretty sure of his answer but needed CRAC authority and expertise to confirm his answer. As a result, able to prepare responsive bid for a major aerospace

APPENDIX B
CBIAC CORE USER INFORMATION

SUBJECT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Logistics	Battelle, Columbus, OH		1,3	Saved money, time	Has received printouts of references available and sources to pursue. In the process of developing methodology and seeing instant information, cost and time to develop methodology dramatically reduced. Medical Command benefitted because information already existed in report form. Found out what had been done successfully. Provided
Logistics, Medical Information	Battelle, Columbus, OH		1,3	Did not perform unnecess. test	Involved in Navy overgarment program. CBIAC looked at large numbers of materials to determine susceptibility to chemicals. Also in program with 3 major airframers. Evaluated aircraft materials against chemical agents. Based on information CBIAC provided, did not have to test all materials and reduced number to test to 50. Saved time background information. Work went more quickly because of it. Felt greater confidence in CBIAC data than that available from DTIC.
Army Data	Battelle, Columbus, OH		1,3	More confidence in data	
Medical Information	CPSC, Aberdeen Proving Ground, MD		1,3	Saved time, money, confidence	Information provided added input into R&D efforts. If had to do search in technical library, would take a lot longer and would require money to do it, and then couldn't be sure it would be as thorough.
Medical Information	CRDEC, Aberdeen Proving Ground, MD		1,3	Potential to save money	Asked questions about VI absorption by Teflon for employee monitoring system. If VI not absorbed by Teflon, could use longer tubes and fewer sensors, saving money on the synchronized part sensor. Data received showed tubing could not be of infinite length, but suggested coatings to inhibit absorption. Work still in review.
Medical Services	CRDEC, Aberdeen Proving Ground, MD	2-3 times faster than alt.	1,3	Clarified answers	Used CBIAC for software development tasks. If had to go elsewhere, would take 2-3 times longer for a quick look study. If had to do it himself, it would take a month, but be inconvenient and impractical. Referred his contractors for decontamination kits to CBIAC to get the answers to questions about shelf life of products.

APPENDIX B
CBAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Bibliography	CRDEC, Aberdeen Proving Ground, MD	\$20,000-30,000; 9 months	1,3		Background information. Tasked to develop evaluation technique for collective protective units from biological effects. CBAC ran searches on biological warfare, agents, and possible threats. Information used later in draft report in assessing testing, including several recommendations to stop us testing. If had to go out on separate properties of paralyne and the contamination survivability of aircraft. Based on information provided, provided cross verification about paralyne and prevented further testing on paralyne as a direct result. Information used in AF-64 contract work.
Technical Information	ONI, PO Box 2382, Anniston, AL		1,3	Lab testing costs	Called for properties of paralyne and the contamination survivability of aircraft. Based on information provided, provided cross verification about paralyne and prevented further testing on paralyne as a direct result. Information used in AF-64 contract work.
Property Data	SA-MC/METH, Ft. Hood, TX		1,3	Saves money	Had CBAC evaluate whether enamel could be a CRT-type paint. Looks like enamel can be used for coating support equipment. Work ongoing, but it is easier and cheaper to use enamel than alternate coatings. Also can do cheaper touch ups versus repainting.
Documents. Bibliography	Honeywell, Minneapolis, MN	Saved 2 weeks	1,3,4	Study with real world applic.	Able to continue work because of CBAC input, including a field manual. Alternative sources would have taken a couple weeks longer. Information supplemented his work. Field manual provided logistics information about policy procedures at the combat level for a fielded system. Hard to get FMs, TMs, Bulletins, but they make systems more relevant in chemical surety work. Will send lists of materials to CBAC to see how they react in chemical environment. Based on data, will only test material for which no information exists. Saves customers money. If had to find info himself, would take 20-30 times as long. Found suitable material to replace canvas in Army litter per needed information about project status of various non-Air Force projects. Called CBAC for information about status. If did himself, would have taken several days. Status information important to determine Air Force course of action.
Property Data	Battelle, Columbus, OH		1,3,7	Saved time, money	
Project Updates	AFSPRC/PR, Lowry AFB, CO		1,5	Saved time	

APPENDIX B
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Referrals	Brunswick Defense, Willard, OH		1,3		Needed information on a project done by Battelle. Got points of contact.
Technical Information	M.C. Gore, Elkton, MD		1,6	Confidence in product	Company manufactures PCFE. Natick R&D Center had let a contract to another company using expanded Teflon. Wanted to be sure had not overlooked anything in their research on an similar product. Requested any public information on the project the other company was involved in, which gave them greater confidence that they hadn't overlooked anything for an analysis of Freon in decontaminating LHWIHA goes. CBIAC showed that goes would be harmed by decon solution. Program goes in production and fixing it had significant impact in time and money. Higher levels decided not worth the pursuing. If had to contract out for tests of Freon, would take 12-18 months. Informant Provided complete, objective verification. Additional information supported findings; some modification in study approach because of lessons learned in IAC. Because CBIAC shows information that exists, saves client time and money. Other resources aren't as responsive as CBIAC and can't/won't release data in timely manner.
Technical Information	ASD, Wright-Patterson AFB, OH	Saved 12-18 months testing	1,7	Information showed problem	
Technical Information	Battelle, Columbus, OH		2,3	Saved money, more efficient	
Property Data	FMC, Santa Clara, CA		2,3	Verification, saved time, money	Contacted for material compatibility information. Information filled gap. If had to do herself, would have cost her salary and would have taken longer because relying on scattered resources. Currently involved in IR&D on Bradley tanks. Information on NBC equipment CBIAC provided has potential benefit for the systems working on. Asked for effects of decontaminants on materials in collective & personal protective systems. Extensive information provided saved a lot of work for them. If talked to contacts, find ideas colored by opinion. CBIAC absolutely objective. If had to do herself, would take 400-2,000 hours at a cost of \$50/hr (\$20,000-\$100,000).
Property Data	Reservoirs, Inc., Houston, TX	\$20,000-100,000	2,3	Absolute objectivity	

APPENDIX B
CBAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Property Data	SAIC, San Diego, CA		2,7	Saved time, authoritative	Needed property data for laser range finder, Commander's Integrated Display. Got from CBAC the authoritative word from the Army on NBC hardening. Improved quality of the product. If had to do himself, would take 10-100 times as long where information not available.
General Information	DM, St. Paul, MN		3		Had been talk in his office about becoming involved in manufacturing protective garments. Based on background information CBAC provided, closed down program because not a good fit anyone. If had to collect information himself, would have spent 3 days on the road, at a cost of about \$2000.
Quality Control Plan	Annisston Army Depot, Anniston, AL		3	Saved a lot of time	CBAC developed quality control plan and gave helpful hints for implementing it. Because of size of project, alternative sources would have charged. If done himself, would take a long time to do research and resulted in inferior product. Is using gas chromatograph mass spectrometer to monitor workplace. CBAC made work simpler because information available in one source. If had to go to multiple sources (CRDEC, DTIC, Duquay), would take longer.
Property Data	Battelle Columbus Operations, Columbus, OH	Saved 1/4-1/2 the time	3		CBAC made work simpler because information available in one source. If had to go to multiple sources (CRDEC, DTIC, Duquay), would take longer.
Bibliography, Documents	Battelle Dayton Operations, Dayton, OH		3	Saved time	Shortened time to get information considerably versus going to DTIC (which on Form 35's can take about 2 months). Most of her work has very fast turnaround (6 weeks to 1 year) and time is critical. CBAC lets her meet sponsor deadlines.
Technical Information	Battelle, Columbus, OH		3		Background information. His report set priorities about which technique to develop at CRDEC. Other sources would have taken 1-3 days (versus 2 hours) to get similar information. CBAC made work easier.

APPENDIX B
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Bibliography	Battelle, Columbus, OH		3	Saved money, time	Had user's contract with Duquay to test materials. Based on holes in CBIAC-provided information, determined to test only those items. Duquay benefitted because didn't duplicate previous work.
Documents, Bibliographies	Battelle, Columbus, OH		3		Used information provides mostly for studies, reports. If had to do work himself, would take much longer, be of poorer quality, and cost more (because of time spent). If contacted military sources, would have taken longer because of the number of calls it would take. Alternative source (OASD/ISA) had only limited CW literature. Based on information provided by CBIAC, helped develop design considerations for advanced test fighter. Other sources would have charged. One source would be Duquay PB library to see information. This would involve travel costs. Other sources generally would take longer.
Property Data	Battelle, Columbus, OH		3	Saved time, money	
Technical Information	RTI, Inc., York, PA		3		Background information. Concerned with cleansing agents and their effects on seals and paints of protective materials. If went to different government agencies, taken longer than could have dealt with.
Technical Information	Consultant, ARDEC, Picatinny Arsenal, NJ	About \$40,000	3		Chose the proper materials for work based on information from CBIAC about products which can stand decontamination. Estimates cost of running test about \$40,000.
Bibliography	CRDEC, Aberdeen Proving Ground, MD		3		Provided information used in other reports he is writing. If did it himself, would take 2 weeks for similar information (no money involved except for his salary).

APPENDIX B
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Bibliography, Property Data	CRDEC, Aberdeen Proving Ground, MD	\$6,000-7,000	3	Worked more efficiently	Used information to further study of threat agents. Narrowed avenues to pursue. If had to go out on contract, estimates would have cost \$8,000-10,000. If had to do it himself, would take 3/4-1 year-month (costing about \$6,000-7,000).
Technical Information	CRDEC, Aberdeen Proving Ground, MD	Saved 70-80 hours	3	Prevented duplicate effort	With questions, has found number of things going on in other services not aware of. Typically CBIAC gave a contact for him to start with versus starting from scratch. If he had to find information for himself, would take 40-50 hours versus 10 hours from CBIAC. Studies also verify what is going on.
Document	CRDEC, Aberdeen Proving Ground, MD		3	Saved time, improved quality	Asked for a copy of the Montreal Protocol, which was used in an ongoing study. If had to go elsewhere, would have taken a matter of weeks. If he had had to pursue it himself, would not have taken the time to get it.
Bibliography	CRDEC, Aberdeen Proving Ground, MD	Saved 3-5 days' work	3		Used information for background. If had to find information for himself, estimates would take between 3-5 days.
Property Data	CRDEC, Aberdeen Proving Ground, MD	Saved time (1 day vs 1 wk)	3		Needed information on material compatibility in NBC survivability. Got information from CBIAC within a day (versus about a week elsewhere). If went to library and did search himself, would take days longer (40 hours x \$45/hr = \$1,800). Time a critical factor.
Technical Services	CRDEC, Aberdeen Proving Ground, MD	\$1,000s, a lot of time	3		Used CBIAC to set up a data base. If he had to do it, it would cost him more in time and money. Costs would include IBM PCs (at \$900 each) plus procurement time

APPENDIX B
CBIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Property Data	Dow Chemical, Granville, OH	About \$250,000	3		Needed information on chemical resistivity of certain polymeric materials. Used information for background information. If had to generate data himself, estimates would take about 2 years and cost about \$250,000.
Technical Inquiry, General Information	Harris Associates, Millersville, MD		3	VEP dropped	Inquired about effect of DS2 on various materials. Involved in value engineering program of DS2. Alternative formula would cost Army millions to evaluate. VEP program dropped for a number of reasons, including CBIAC input. (Had hoped to find alternative to DS2 because constituents in short supply and increasing cost)
Bibliography	Lockheed, Santa Clarita, CA		3	Greater efficiency	Used information for series of vulnerability assessments of C-130, P-3 airplanes. Also beneficial for proposed Lockheed ATF. Information changed the way they planned work; gave an idea of what could be done.
Documents, Bibliography	Naval Air Engineering Center, Lasemurst, NJ		3		Bibliography let her order most appropriate documents so initial research went faster. Because got information from CBIAC fast, work for NAVSEA delivered on time, saving money.
Bibliography	Naval Surface Warfare Center, Dahlgren, VA		3	More focused work	Literature searches from CBIAC more focused because CBIAC weeds out the "junk." Would take longer to go through base-generated DTIC bib. Use information for preliminary research.
Database Services	Program Executive Office, Aberdeen Proving Ground, MD		3	Improved efficiency	Asked them to help her get her management files into a data base. Hoped to get it into Lotus. While they did provide her with information about ways of improving the current data base, she was unable to follow up, due to time and funding constraints.

APPENDIX B
CBIA CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
General Information	FMC Corporation, Santa Clara, CA		3,4	Able to work to government req	Desperately tried to get a copy of AR 7071 and unable to find anyone (before CBIA) who would provide a copy of it. Most contractor testing work on Bradley done before Req, so needed follow-on tests to see if met Req. Because CBIA database provided information about various materials on tank, only had to test those with no information.
Bibliographies, Referrals	McDonnell Douglas Aircraft, St. Louis, MO		3,4	Saved money	Used information to develop engineering design guidelines, operational concepts, and perform engineering trade studies. Information for trade study provided cost effective way of working. Did not duplicate previous efforts. It has to call all contacts, would take forever.
Bibliographies, Property Data	Partheon, Bedford, MA		3,4	Saved time	Responsible for designing NRC standard for contamination survivability for Missile System Division. Jim McNeely provided information, reviewed standard, and assisted in project. Believes without CBIA, task would have taken twice as long and be of poorer quality.
Property Data	ILC Dover, Frederica, DE	Saved company, govt. money	3,6		Company manufactures collapsible fuel and water tanks with urethane coating. Went to CBIA to see if coating would meet CB requirement. Information provided indicated tanks would not. Company made a "no bid" decision, because bid would be unresponsive (saved company's R&D money). Sent study to contracting agency, which allowed them to ch
Referrals, Computer Models	CRDEC, Aberdeen Proving Ground, MD		3,7	Greater responsiveness	Several programs. Included information on holographic display systems in technical report. Modeling information passed to modelers. Information provided for laser standoff detection program resulted in greater productivity.
General Information	General Electric Co., Utica, NY		4		Suddenly discovered regulation requiring chemical survivability. Went to CBIA for a quick overview of what CB protection entails. Has left company and believes project has stalled. Believes because of briefing, has better insight into future requirements.

APPENDIX B
CBAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
General Information	Kaiser Electronics, San Jose, CA	Saved \$2,000 (no need to test) 4,7		Able to meet regulations	Manufacture optical displays for B12 aircraft. Ran across unexpected chemical hardening requirement. Information provided background information, what was technically possible, narrowed focus. Saved a couple \$1,000 in time requirements by going to CBAC.
Bibliography	Battelle, Pacific Northwest Labs, WA		5		Used information in work on chemical sensors for nerve agent simulants. Information made him aware of work going on in other labs.
Referral	SRI International, Menlo Park, CA		5	Recovered lost govt. work	Involved in remote sensing program. Heard work producing tabular data on particulate sizes in chemical battlefield had been done in early '80's. No one contacted had heard of it. CBAC located lost government-sponsored data so information did not have to be redone. (Person working on it had left, and CTR had left shortly after his Seal business which manufactures materials used in Stealth technology. Wanted to see how his materials respond to decontamination. Sent general literature on report, as well as test centers. Does not want to test materials if can avoid it because extremely expensive for seal business.
Property Data	Fuzetron, El Cajon, CA		6	May save money on lab fees	National/International seal business go-between with the DoD. Had client (manufacturer of protective clothing) interested in marketing in the US. Calling around in DOD would take long time. Seal business can't afford to do a lot of research; CBAC provides definite benefit to seal businesses.
Referrals	Logistech, Alexandria, VA		6		Went to CBAC for information on chemical compatibility of CM agents with metals and some elastomers to bid on a proposed contract. (Contract required certain information). Information changed direction they were taking on the proposal and enabled them to submit responsive proposal.
Property Data	Parker Hannifin		6		

APPENDIX B
CIIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Referrals	Tradeways, Vienna, VA		6		Involved in military exports. Used information provided as marketing tool.
Technical Information	Pyle Laboratory, Inc., Montsville, AL		6		Use information for marketing purposes. CIIAC provides him with market review from the CBS.
Docament	Battelle-Montsville Operations, Montsville, AL		7		Used information provided in developed a technical plan for nonnuclear kill lethality of chemical warheads. knows of few other similar resources available.

APPENDIX E:

INDIVIDUAL RESPONSE BENEFITS FROM GACIAC

APPENDIX E
GACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents, Conference	AAI, Hunt Valley, MD		0		Uses as reference material and to keep abreast in the field.
Documents	Aerospace Studies, Kirtland AFB, NM		0		Documents used for studies and analysis.
Documents	Aerospace Systems Inc., Richardson, TX		0		Librarian. Documents basically used for reference.
Documents	AFATL, Eglin AFB, FL		0		Librarian. Keeps as reference document.
Documents	AFMIL, Wright-Patterson AFB, OH		0	Saves time	Librarian. Most of the information used as reference and background material by the engineers. Has a terrible time getting information from DTIC because requests get lost, bogged down, or denied. GACIAC security conscious but forthcoming.
Documents, newsletters	AVRADCON, Fort Eustis, VA		0		Use for reference and research.

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APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	Ballistic Missile Defense Command, Huntsville, AL		0		Library. Documents basically used for reference.
Documents	Naval War College, Newport, RI		0		Library. Used as a reference.
Information	Defense Mapping Agency, Washington, DC		0		SAC major benefit item. Used information primarily for background information.
Outgoing Information	NSA, Washington, DC		0		SACIAC representatives talked to several NSA officials and discussed about SACIAC capabilities. Based on conversations, asked SACIAC for outgoing information. NSAs responded that SACIAC could provide information in paper format.
Documents	Ford Aerospace and Communication, Newport Beach, CA		0		Library. Documents basically used for reference.
Documents	Ford Aerospace, Newport Beach, CA		0		Library. Documents used for reference and research.

APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	General Dynamics, San Diego, CA		0		Documents used for reference only. Involved in state of the art research. Information provided older than he cares for.
Documents	General Research Corporation, Santa Barbara, CA		0		Librarian. Keeps as reference document.
Documents	Mercedes Corporation, Clearwater, FL		0		Librarian. Reference material.
Documents, newsletters	McDonnell, McLean, VA		0		Librarian. Reference works.
Documents	AF LASCAN, Adelphi, MD		0		Good documents for background information. Better referred as a result.
Documents	AF Engineering and Service Center, Tyndall AFB, FL		0		Good documents for background information.

APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	IDENTIFIED BENEFITS	BENEFIT TYPE	UNIDENTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	ITEK Optical Systems, Lexington, MA		0		Librarian. Believes used for reference.
Bibliography	Lawrence Livermore National Lab. Livermore, CA		0		Technical Information Specialist. Ordered document for engineer. Believed engineer used for research.
Documents	Cotton America. College Park, MD		0		Librarian. Documents basically used for reference.
Documents	RTV Aerospace and Defense, Dallas, TX		0		Librarian. Keeps as reference document.
Document	RTI Corporation, Raleigh, NC		0		Librarian. Believes engineers use as reference. Alternative sources may take longer.
Documents	NSA, Hall's Island, VA		0		Background information being used to write proposal(s).

APPENDIX E
SACIAC CODE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	Navick A&B Center, Retick, AA		0		Needs for background information.
Documents	Naval Air Engineering Center, Lanesport, NJ		0		Documents used for reference and information.
Documents	Naval Postgraduate School, Postorev, CA		0		Used for research and background information.
Documents	Naval Research Lab, Washington, DC		0		Librarian. Documents used as reference tools.
Documents	Naval Surface Warfare Center, Silver Spring, MD		0		Librarian. Documents used as reference tools.
Bibliography	Naval Weapons Support Center, Crane, IN		0		Need bibliography for ordering relevant documents.

APPENDIX E
GACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Bibliography	Office of the Secretary of Defense, Washington, DC		0		Used information for Summer Study work at Naval Postgraduate School.
Bibliography	Office of the Technical Director, ASMA, NH		0		Friend had had bib run and felt he would like to see it. Got a copy of it. Ordered documents based on bib.
Bibliography	Rockwell International, Anaheim, CA		0		Preliminary research. Used to order documents.
Documents	Rockwell International, Buluth, GA		0		Librarian. Documents basically used for reference.
Documents, Technical Assistance	SURVIAF, Wright-Patterson AFB, OH		0	Helped her customer meet need	Had a request from a customer that was more appropriately served through GACIAC (rather than SURVIAF). Referred client to them.
Documents	Westinghouse Electric Company, Baltimore, MD		0		Librarian. Documents used in research.

APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Bibliography	Harris Corporation, Melbourne, FL		1	Verification	Used search request to correlate and verify what's going on in the field.
Bibliography	University Research Foundation, Greensboro, NC		1		Had bibliographic request for background information on millimeter wave radar. Unfortunately confirmed his suspicions that there had been no additional work done in the area.
Documents	Ballistics Research Lab. Aberdeen Proving Ground, MD	Saved 6-7 man-weeks	1,3	Substantiated thinking	Provides support for work doing at time and substantiated his thinking. Generally use as a reference text. If he had to search for similar information, would take 6-7 man-weeks in library doing work.
Conferences	AF Armaments Laboratory, Edlin AFB, FL		2,3,5	Objective, avoids duplication	Documents prevent duplication of efforts. SOARS important because SACIAC objective, no an to grind. Can immediately find out who has program in progress. Good way for industry-government communication. Because SACIAC is independent and has "government agency flavor", industry more likely to talk to them than with conceiving "for profit" com. Use to stay abreast in field, reference.
Documents	Combat System Support Activity, Aberdeen Proving Ground, MD		3		
Documents, Bibliographies	General Electric Company, Pittsfield, MA		3	Saves time	Came into area of guidance and control uninitiated. Used to learn what technology available and what people were working on. If had to do work himself, would take some time, manpower to do.

APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Document	US Army ARDEC, Picatinny Arsenal, NJ		3	Improved performance	Uses several documents as training manuals for new engineers; enhances learning curve. Documents in general relevant to work he's doing.
Documents	Aerostat Precision Weapons, Azusa, CA		3,3	Shortened development time	Shortened development on a project because found out what had been done in good detail. Provided referrals so could discuss topics (laser welding with Texas Instruments, ICE of chips and boards with Hughes) directly with developers. Could do SACIAC research himself, but not enough time. Learned what did/didn't work.
Conferences	DARPA, Arlington, VA		3,3	Prevents duplicate effort	SACIAC serves as executive secretary for ATR Working Group (arranges meetings, comiles documents, minutes, etc.). Efforts assist ATR community to prevent duplicating efforts.
Bibliography	Office of Naval Research, Arlington, VA		3,5	Prevents duplication, R&D aid	Bibliography served two purposes to help him manage his R&D and to see what is going on in the field (and avoid duplicating effort). Information helped him make program decisions.
Documents	Naval Weapons Center, China Lake, CA		3,3,7	Improved training program	Uses PSN Handbook as training manual. Gives it to all new employees. Provides description of armaments, uses, etc. Assists new employees in learning about their field, improving their performance. Center benefits because as the learning curve went quickly.
Documents	AFMIL, Wright-Patterson AFB, OH		3,7	Saves time, aids in teaching	Use technical manuals as entry level training manuals for new engineers. Manuals introduce them to concepts and serve as training aids. If ordered information from DTIC, not needed some (greater detail but longer time to read and learn). To develop similar training manual would take many man-months of effort.

APPENDIX E
GACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	Air Test and Evaluation Center, China Lake, CA		3,7	Improved performance	Got about 6 copies of PGM Handbook; excellent reference document to have around. Distributed one copy to each division for use as a training manual. Written in 'pilot-use'.
Documents	AI, Hunt Valley, MD		5		Uses basically to educate his enough to ask intelligent questions. Keeps employees up to speed about direction technology is heading. Helps determine where to invest R&D money.
Conference Support	AFMIL, Wright-Patterson AFB OH		5	Forum for government, industry	Various conferences GACIAC assists with provide forum to keep government current about what is going on. Forum means he's no more than 3 months behind the curve. If GACIAC didn't exist and he had to attend meetings, information incomplete.
Documents, Symposia	General Electric Company, Philadelphia, PA		5	Improved communication	Uses documents mostly for reference. Works in the missile sector arena. Because of symposia and documents, did a better job. Bridged gap between industry and government.
Documents	Martin Marietta, Glen Burnie, MD		5		Newsletter provides current awareness.
Documents	Naval Research Lab, Washington, DC		5	Provides good forum	Generally use information as reference material. Conference proceedings information provides good forum and POCs for work in field.

APPENDIX E
SACIAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	Bruce Williams, Cleveland, OH		5,6		Uses for current awareness and marketing information.
Documents	Loral Defense Systems Division-Akron, Akron, OH		6		Uses for research, marketing contacts.

APPENDIX F:

INDIVIDUAL RESPONSE BENEFITS FROM RAC

APPENDIX F
RAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	General Dynamics-Convair Division, San Diego, CA		0		Librarian. Believes that scientists and engineers use them as reference documents.
Documents	ITT, Clifton, NJ		0		Reference material only.
Documents	NASA, Ames Research Center, Moffett Field, CA		0		Involved in state-of-the-art research and most information out of date for his purposes.
Documents	Rospatch, Fishers, NY		0		Use for reference; only source available.
Documents	SAAB America, Herndon, VA		0		Purchasing Administrator. Does not know what the technical people in Sweden do with the documents, but forwards them to Sweden.
Documents	Unisys, Paoli, PA		0		Librarian. Engineers use documents for reference. As librarian, believes it is more cost effective to go to RAC for information than multiple sources.

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APPENDIX F
RAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Technical Inquiries	Univ. of Pa., PA		0		Uses documents from library largely as a reference or when gets stuck and needs information.
Documents	Postnecouse, Baltimore, MD		0		Uses for reference. Alternate sources take longer. Unlikely to generate information herself because lacks time and money. RAC information incorporated in in-house methodology.
Documents	Control Data, Arden Hills, MN		1	Improved R&D	Helped to develop ESD (electrostatic device) expertise 6-7 years ago. At time, no other sources available.
Documents	Johns Hopkins University, Laurel, MD		1		Librarian. Believes that documents are used as references. Also, engineers find newsletter helpful. Believes if RAC did not exist, failure rate data would have to exist elsewhere, but doesn't know where.
Documents	Rocwell International, Cedar Rapids, IA		1,2	Substantiation	Usually uses the documents to substantiate his reliability predictions. Occasionally uses them to lead to other sources of information.
Engineering Services	Taylor Instruments, Rochester, NY	At least \$1,000 + travel	1,2	Independent verification	Sought independent verification for client that redundant systems ought to have routine maintenance to reduce operating costs. Would have had to go to U.K. (Systems Reliability Services) for similar work if RAC did not exist. Expected fee = \$1,000; does not include mandatory travel expenses (in excess of 1 month in the U.K.).

APPENDIX F
RAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Training Courses, Documents	Apollo Computers, Chelmsford, MA		1,3	Determine warranties	Has sent several of his engineers for training in design reliability. Only information source looking at large population over time. Information used in designing proposals with failure rates and warranty rates. To collect information like RAC so time consuming wouldn't bother.
Documents	Eastam Kodak, Rochester, NY		1,3	Design changes	Knows of no other source like this. Used information provided for predictions on product reliability. Information allowed changes in some components and design of products.
Technical Inquiry, Documents	ESL, Sunnyvale, CA		1,3	Saved a lot of money	Used information in reliability predictions. Knows of no other source (except RAC). Data prevents duplicating information in the lab (expensive).
Documents	Honeywell, Phoenix, AZ		1,3	Made work easier	Use the documents mostly in reliability analyses and predictions. Information provided made it easier to perform studies. Would not be able to generate data for himself.
Computer Teletype, Documents	Martin Marietta, Orlando, FL		1,3	Saved money, changed designs	Information from RAC convenient so does not have to monitor literature. Going to other sources more difficult and time consuming. Other comparable sources cost double or triple RAC. Used information in SHRIM-2. Depended on storage & mechanical data in RAC document. Benefitted from RAC in design considerations.
Technical Inquiry, Documents	Raytheon, Portsmouth, RI		1,3	Background information	Uses for field histories of microcircuits, failure analysis, how a system works in a given environment. Helps determine which parts need additional lab failure analysis. Could not do other RAC work in-house.

APPENDIX F
RAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents, Engineering Services	Rockwell International, Cedar Rapids, IA		1.3	Saved time, manpower	Uses RAC for documents and as such works more efficiently. Because RAC screens electronic parts, means doesn't have to do internally, saving money, manpower. RI would not be able to generate broad enough data base in-house.
Documents	O'Neill Assoc., Dayton, OH		1.6	Met contract requirements	His company is a small business performing logistic analyses. Has been contracted to perform reliability predictions and failure mode analysis for SOI-M LLL surveillance systems V-22 Osprey and a prelaunch system. He could not complete or meet contract requirements for the predictions without access to RAC data base.
Failure Rate Information	Raytheon, Sudbury, MA		1.7	Saved money in lab fees	Needed SGA information on semiconductors. Information provided saved his having to perform costly lab work, and he did not have to do statistical analyses. Cost of doing work himself prohibitive and would have had to ask relief from radar failure rate requirement. Works on AEGIS, TARTAR, PATRIOT, and miscellaneous FAA contracts. Used RAC for reliability predictions and analyses and to set up in-house reliability capability. Information used in making design changes for greater reliability. With in-house capability may be less expensive to attack reliability issues, but lack the library and database RAC has.
Technical Inquiry, Documents	Veeder Root, Hartford, CT		1.7	Enhanced quality assurance	Used RAC to settle difference of opinion at Digital. Has gone for information on activation energies of ICs. Could collect the information himself at a significantly higher cost (especially failure rate information). Getting data would take period of years and is very expensive.
Technical Inquiry, Documents	Digital Equipment, Maynard, MA		2.3	Objectivity, saved money	Used RAC to settle difference of opinion at Digital. Has gone for information on activation energies of ICs. Could collect the information himself at a significantly higher cost (especially failure rate information). Getting data would take period of years and is very expensive.
Data Base, Publications	Product Assurance Directorate, Redstone Arsenal, AL		3	Refined capabilities	Well aware of RAC's capabilities, but due to funding limitations, cannot use a lot of their services. Believes his capabilities would be better if he had funds to use RAC's special services. Currently RAC information used to refine his analysis.

APPENDIX F
RAC CORE USER INFORMATION

PRODUCT NAME	USER	QUANTIFIED BENEFITS	BENEFIT TYPE	UNQUANTIFIED BENEFITS	DESCRIPTION OF BENEFIT/DISCUSSION
Documents	Contel, Fairfax, VA		6		Librarian. Believed engineers use documents in proposal preparation work for the reliability/maintenance matrix of the proposal.
Documents	Howell, Edina, MN		6,7		Use as a reference work for studies, proposals. Indirectly believes information from RAC on failure rates, failure mechanisms may have had an impact on the S0-torpedo program and the CED system for the Air Force.

OUTPUT SCREEN